plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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Measurement and Automatic Control of the Etching Strength of Ferric Chloride

Preliminary Investigation of the Effect of Brightening Additions in Nickel Sulfate Plating Solutions

Cyanoaurate (III) Electroplating Baths, Their Chemistry, Preparations, and Some Physical Properties

The Polarographic Analyses of Contaminants in an Acid Cyanide Gold Plating Solution

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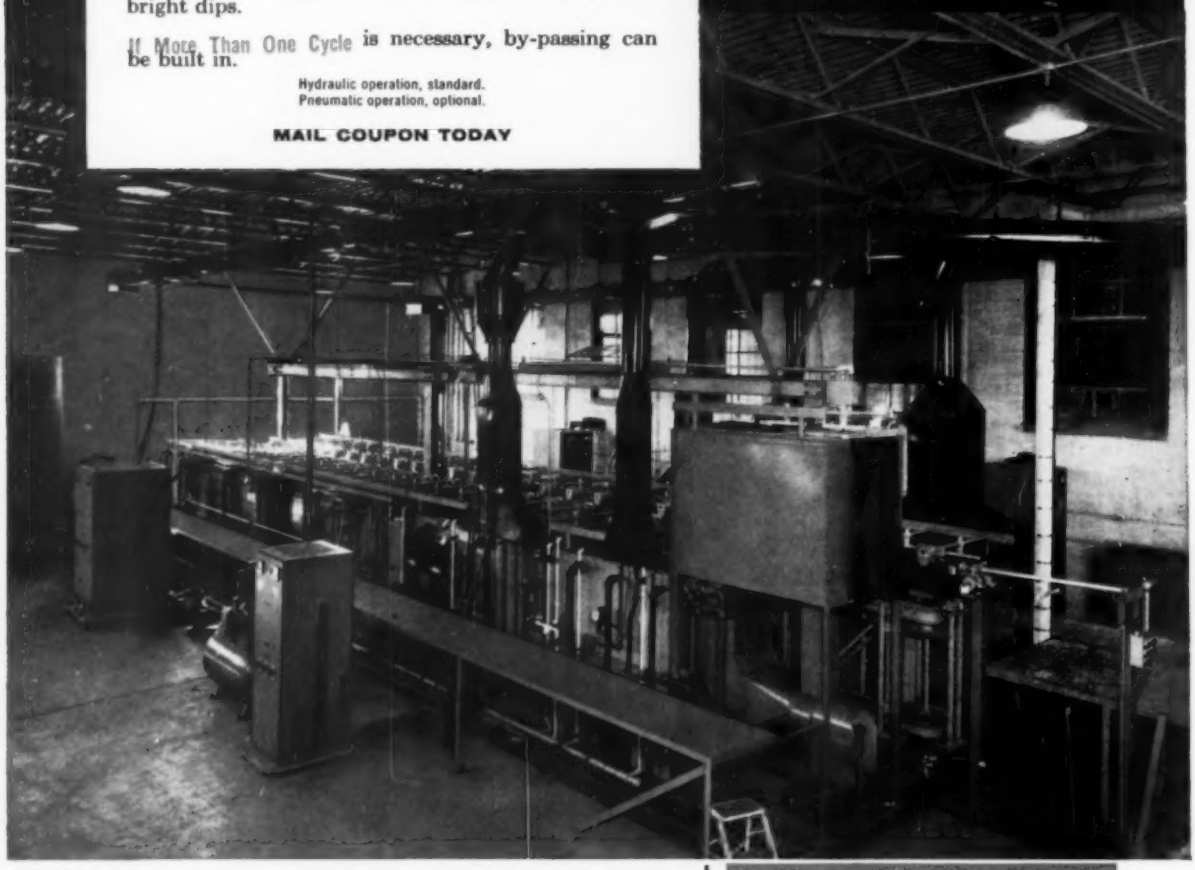

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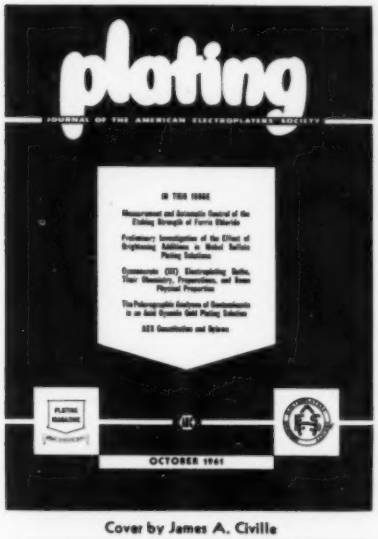

Cover by James A. Civille

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JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

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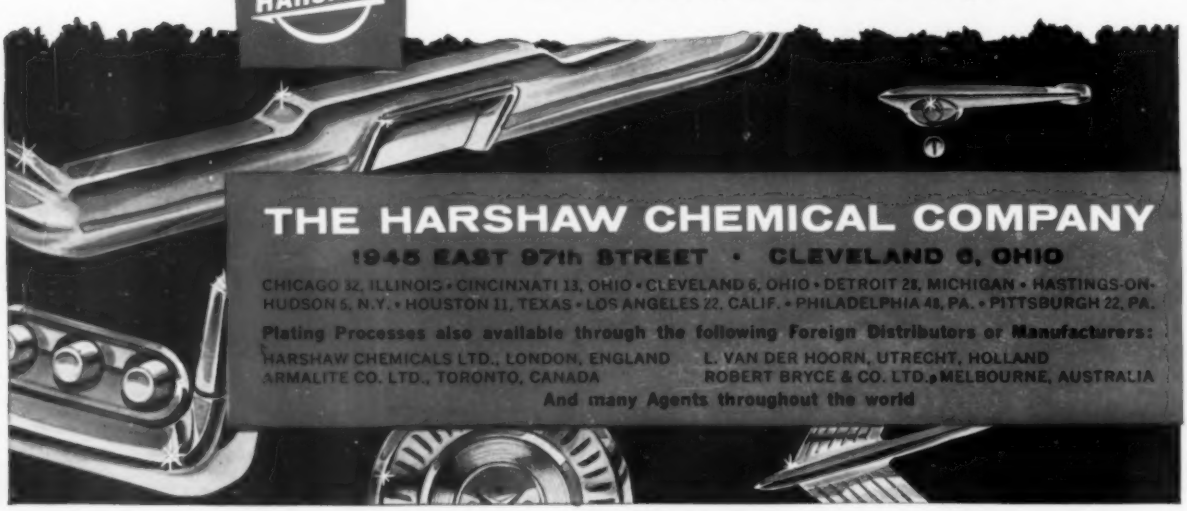

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EDITORIAL

"VALUE"

"VALUE", in our dictionary's simplest definition, is "the property which renders a thing useful." It is synonymous with "worth." Subjectively, a property or a service is "valuable" to us if it serves our own need or desire or convenience worthily. Objectively, a property or a service is deemed "valuable" if it enjoys a demonstrated record of fulfilling the needs or desires or conveniences of the many.

Most of our well-established organizations and enterprises have reached their longevity and stature of today because, in the performance of their function, each has rendered desired "values" to those dealing with it. From abundance, take your pick as to example. As a random choice, consider Sears Roebuck & Co. Born as a mail order pioneer in 1886, it diversified by inaugurating its retail store operations in 1925. Today, it not only is an international mail order and retail store goliath but is also a titan of many diversified interests ranging from insurance to tires.

Like the other successful enterprises in respective fields of human endeavor, our random example gained its status on the basis of the "values" passed on to its customers from origin to date. In the long ago, for random instance, many of the mysterious looking wads of hair called a "rat" that many women wore so as to be a la mode, came from Sears—so too, for further random example, did grandpa's "Fancy Colored, Mummy Effect, Worsted Round Cut Sack Suit." The wide range of its many early "values" multiplied with maturity. A Georgia gubernatorial candidate, not too many years ago, courted election on the campaign slogan, in effect, "For Georgia, the Cotton Farmer and the Sears Roebuck Catalog." That's public acceptance—evident outcome of "values" rendered.

American Electroplaters' Society, Inc. (AES) is another of these examples. From humblest beginnings some 52 years ago, it has since grown to international prestige and stature. It has endured and progressed essentially because its members, thirsting for further knowledge of the arts and sciences of electroplating, metal finishing and allied arts and therefore for even greater competency and for even greater self-improvement, found AES's educational services personally valuable—hence evaluated AES itself as worthy.

In an AES composed of thousands of members internationally, it is, of course, impossible to determine specifically the degree that each one "values" his AES membership. In monetary measure, however, AES recently had this happy example via a letter received from a Member-at-Large—a metal finishing and AES stalwart of Switzerland:

> "Answering your letter of July 1, I am sending here enclosed, a check for $11 in payment of my Member-at-Large dues. In your letter you comment on the benefits of AES membership. Your calculation shows that a Member-at-Large paying $11 gets at least $30. This may be numerically correct, but I want to tell you that I value my AES membership much higher. It is my experience that a careful reader of PLATING MAGAZINE and of TECHNICAL PROCEEDINGS gets invaluable information. I am, therefore, glad to attach to this letter, a check for $500 for the AES Research Program to show my high esteem of the AES . . . "

The rate of AES's membership and Branch growth quantitatively over the last half-century demonstrates the "value" of AES to its respective members. The current membership expansion program described in the AES News Section of this PLATING MAGAZINE issue is intended to radiate those "values" among many additional qualified men and women engaged in electroplating, metal finishing and allied arts. You can demonstrate your own "value" of AES by joining in the campaign and stimulating these others to join and share AES "values."

John P. Nichols

Executive Secretary
American Electroplaters' Society, Inc.

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INDICATE A 1011.

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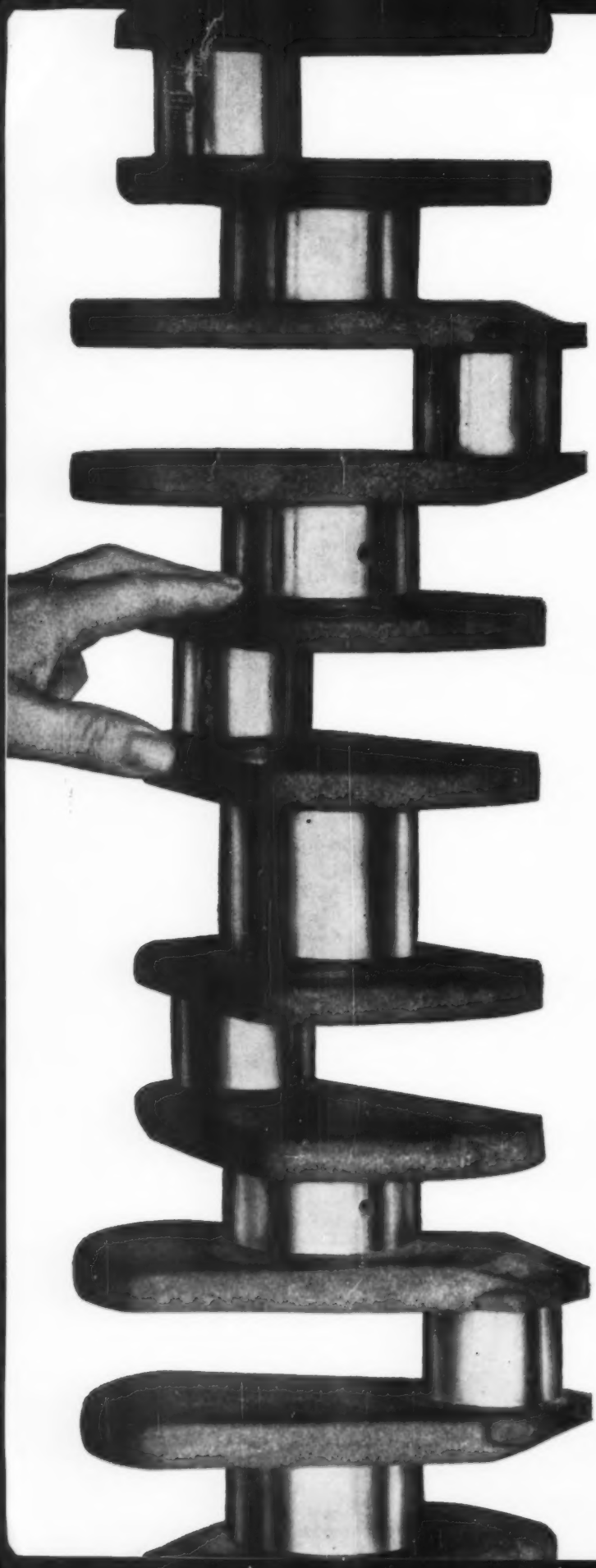

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INDICATE A 1012.

91%*

THE percentage of aggregate PAID subscription renewals of PLATING MAGAZINE for the twelve-month renewal period covered by its Publisher's Statement of June 30, 1961, latest available, was an astronomic 91%.*

It means, of course, that 91% of those who invested in an annual PLATING MAGAZINE subscription, whether members or non-members of American Electroplaters' Society, Inc. (PLATING's parent), demonstrated the value to them of that investment by paying for renewal of their subscriptions expiring during that stated period.

As for consistency, it is worth noting that the percentage of aggregate PAID subscription renewals of expired PAID subscriptions of PLATING MAGAZINE for the full twelve-month renewal period covered by its ABC Audit Report of December 31, 1960 (latest available) was also an astronomic 91%.* It was 88% for the twelve-month renewal period covered by its Audit Report of December 31, 1959.

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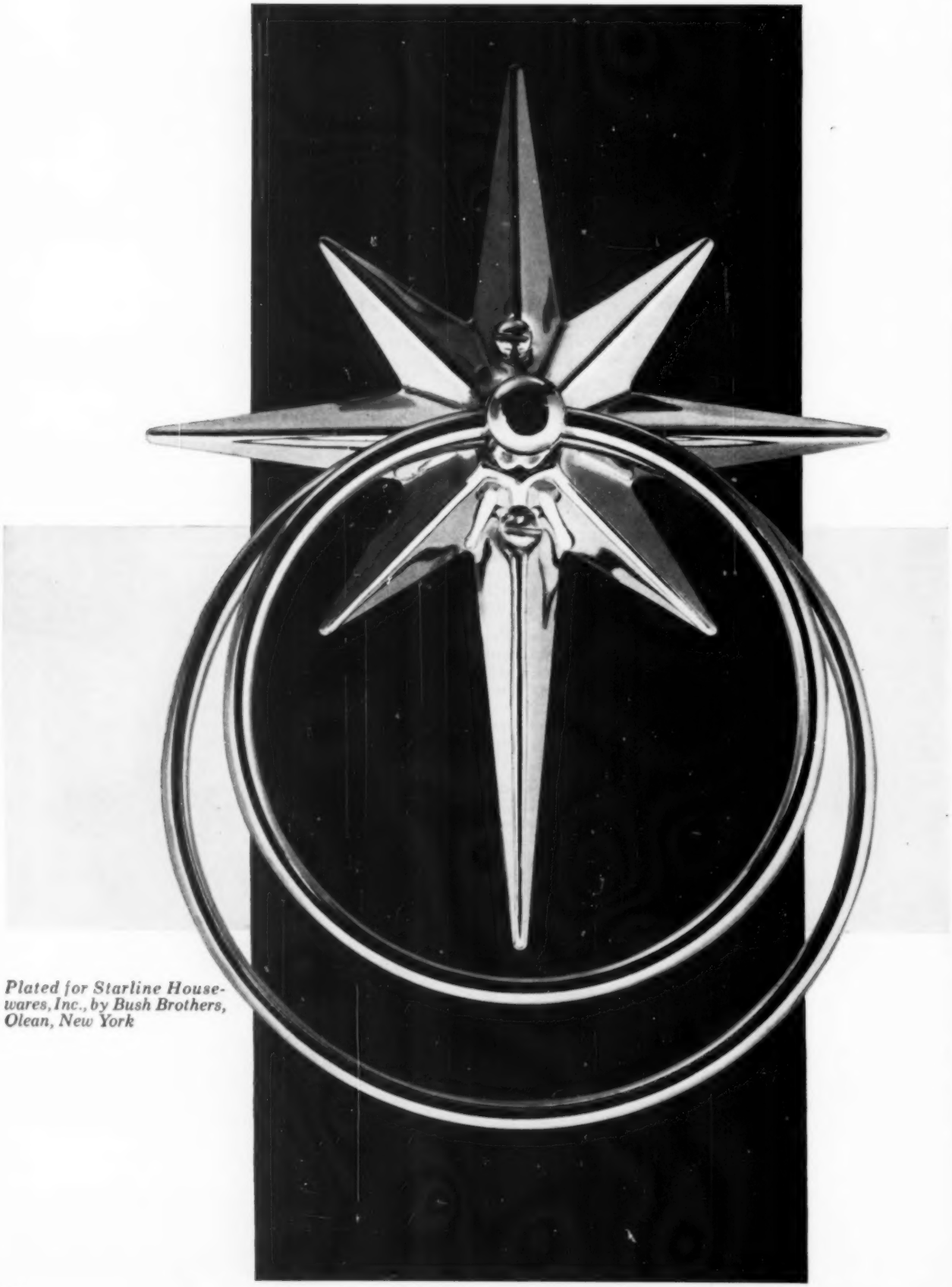
*Aggregate percentage based on publisher's consolidation of renewal percentage data reported in 1) ABC Publisher's Statement of June 30, 1961 [Subscriptions other than Association and Bulk 78.82% (897 renewals of 1138 expirations); Association 93.41% (6961 of 7452); Bulk 87.23% (560 of 642)] and 2) ABC Audit Report of December 31, 1960 [Subscriptions other than Association and Bulk 83.05% (867 renewals of 1044 expirations); Association 92.85% (6424 of 6919); Bulk 85.10% (577 of 678)].



Plated for Starline Housewares, Inc., by Bush Brothers, Olean, New York

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...just chrome over
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BOOKS

Remittance must accompany all book orders placed with AES Headquarters.

Schnellanalysenmethoden fur galvanische Bader (Rapid Methods of Analysis for Plating Baths), by R. Weiner and C. Schiele, 115 pages, price about $2.25, published in 1960 by Eugen G. Leuze Verlag, Saulgau/Wttbg., Germany.

While this book is worth while and of good quality, it fails to live up to its title. The time required for the different determinations is not given, and there are almost no comparisons of the relative speed of the various methods. The more complex question of the speed and convenience of the different methods for running a number of identical samples simultaneously does not seem to be discussed. It appears that only single determinations are considered.

Typical of many books on chemical analysis, the entire burden of the choice of method is placed upon the analyst. One can use either this or that method, or a metal can be determined by one of the three methods given! This is noteworthy of the entire last chapter which gives methods for the complete analysis of eleven common plating baths.

It appears more than ever a measure of the ability of an analyst for him to select the best and most convenient method for his need, and then prove its accuracy and usefulness under his conditions. One would think that the authors of textbooks could do more to help him. This is particularly true in the analysis of plating solutions, where the conditions are somewhat fixed and special, and a great deal of accuracy can often be sacrificed for speed and convenience. (Suggestion for an AES Research Project?)

In the Preface and the Introduction the authors review the ground they expect to cover and point out that they of necessity depend on more detailed treatises for more complete information. In the second chapter a general review is given of the methods they emphasize as rapid methods: conventional electroanalysis, complexometric titration (chelatometry), and potentiometric titration, together with the make-up of standard solutions and indicators.

The authors appear to assume that all volumetric, potentiometric or electroanalytic methods can be considered "rapid" as compared to gravimetric methods. Thus only a complicated iodometric method is given for sulfate determination in chromium baths, and there is no mention of the centrifugal method in common use for control purposes in this country.

The need to adjust the *p*H of a nickel bath before titrating the boric acid is not mentioned. A preference is indicated for removing the nickel before titrating the boric acid to improve the accuracy, but this is generally a time-consuming complication. The authors finally point out that the accuracy of their simple phenolphthalein titration is sufficient for control purposes. The reviewer used the mixed indicator method patented by E. M. Baker and the C. G. Spring and Bumper Co., in 1923, and it would seem about time that this method was rediscovered (U. S. 1,504,207 and D.R.P. 432,522).

Chapters three and four comprise the main portion of the book (pages 43 to 101), and give respectively 40 methods for the determination of 15 metals, and 17 more for the determination of 11 acids. Pertinent recent references are given for many of the determinations. Interfering elements or compounds are clearly pointed out in each case.

Also on the positive side, the authors appear to have used and tested all of the methods given, rather than quoting some from other sources. The new method of complexometric titration with chelating agents is recommended whenever possible, and the book is presumably of special value to those interested in this method. It is well organized and well indexed, and anyone accustomed to the German language would have no difficulty in locating a particular method. In view of the relatively low price, it is quite a worth-while book. It is No. 3 in the series reviewed in PLATING 47, 341 (1960).

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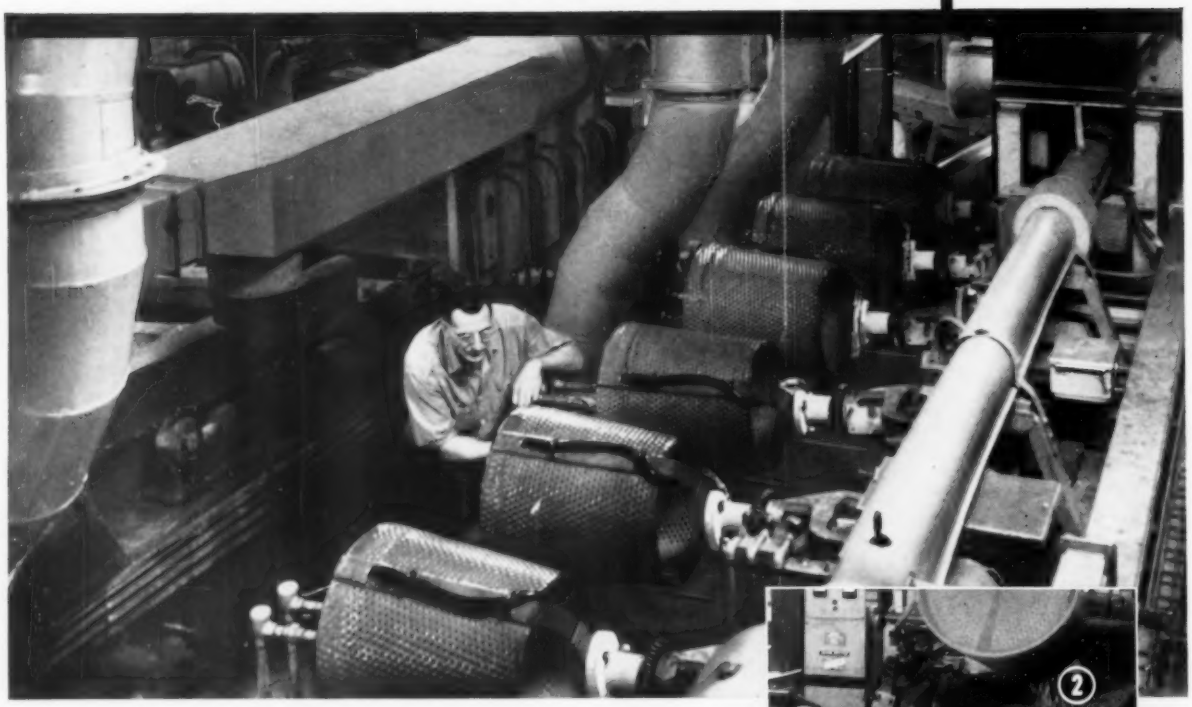

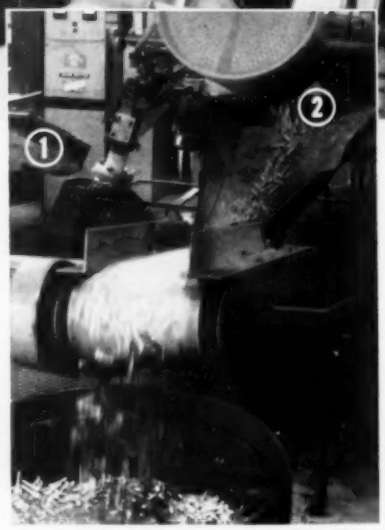

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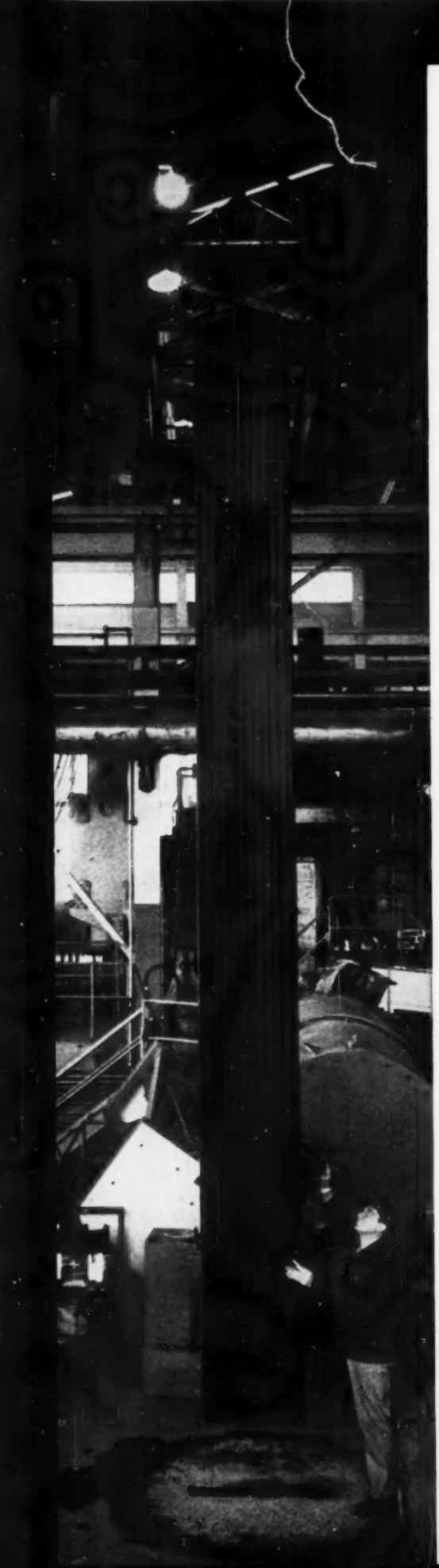

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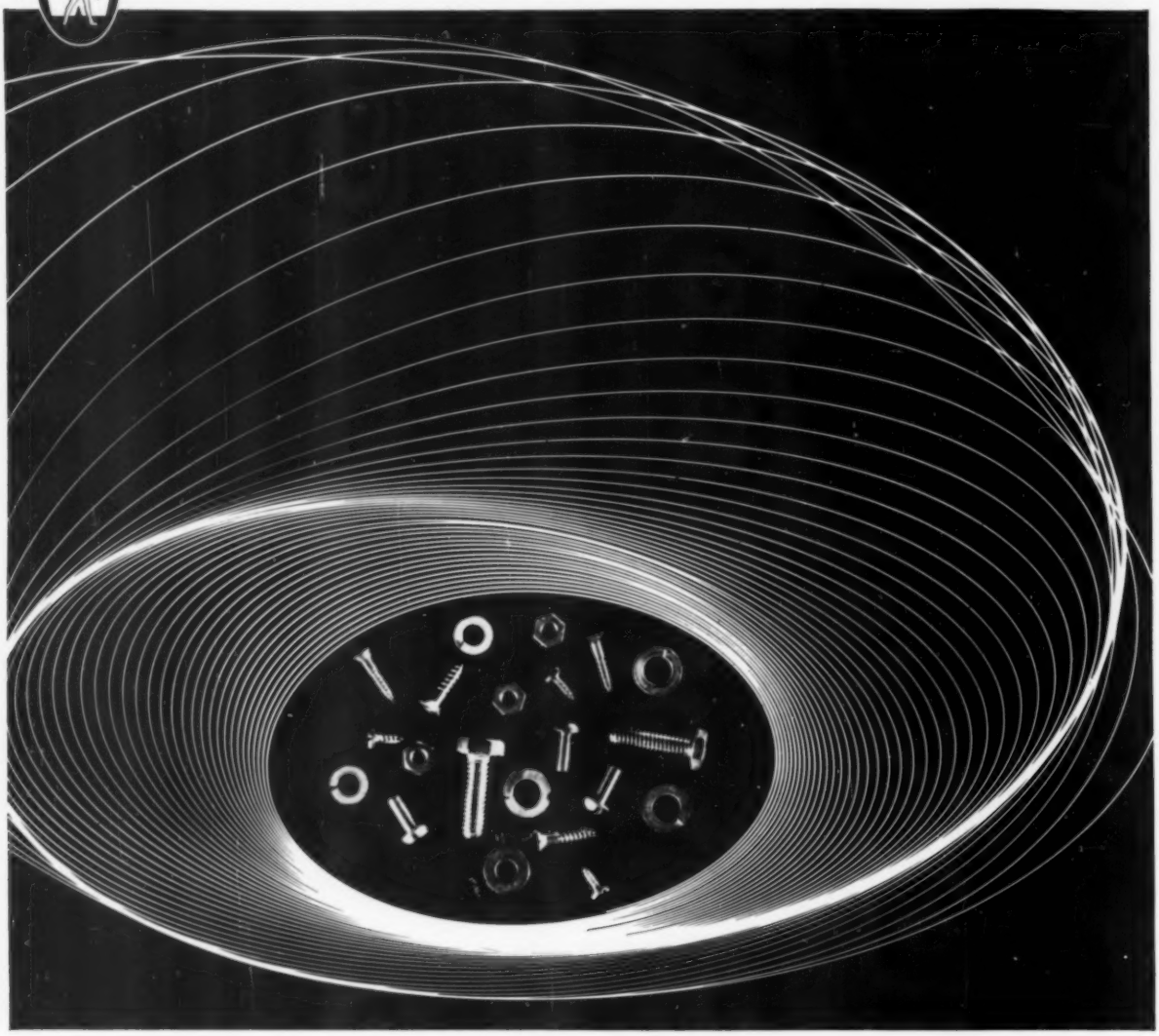

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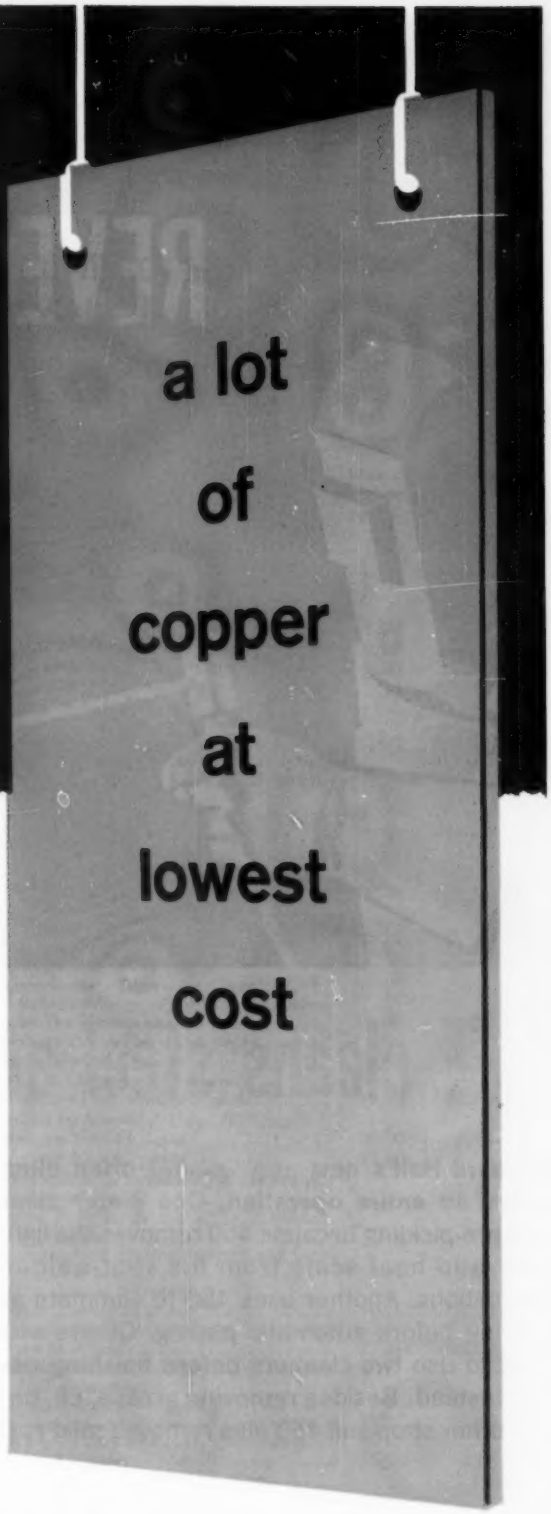

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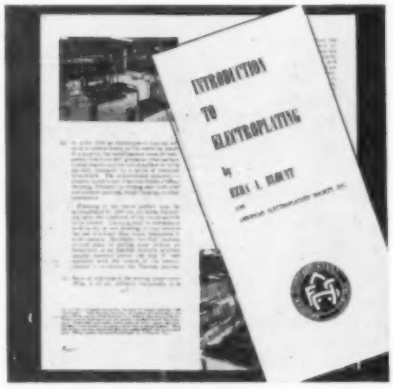

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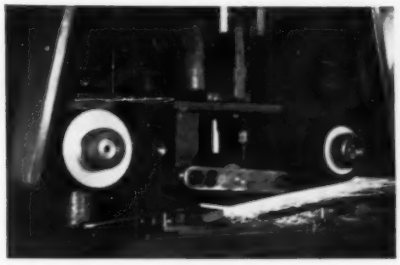

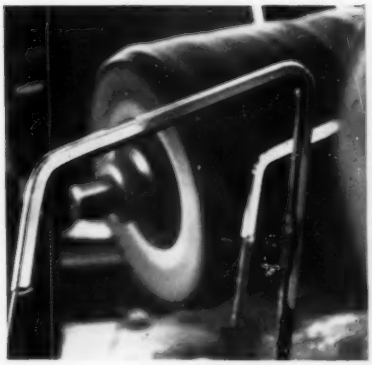

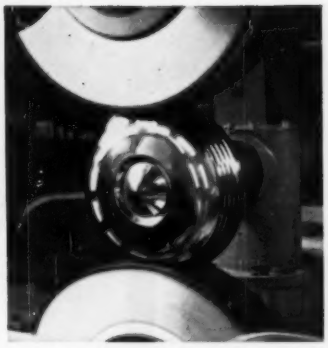

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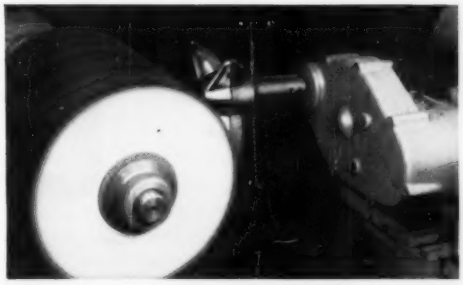

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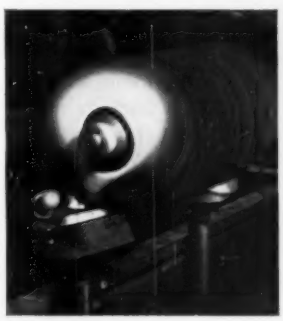

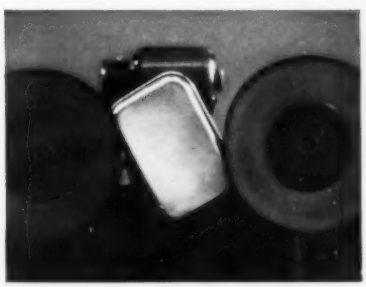

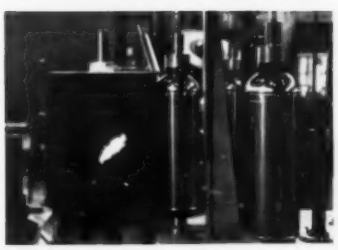

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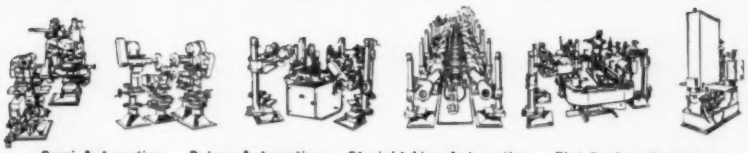

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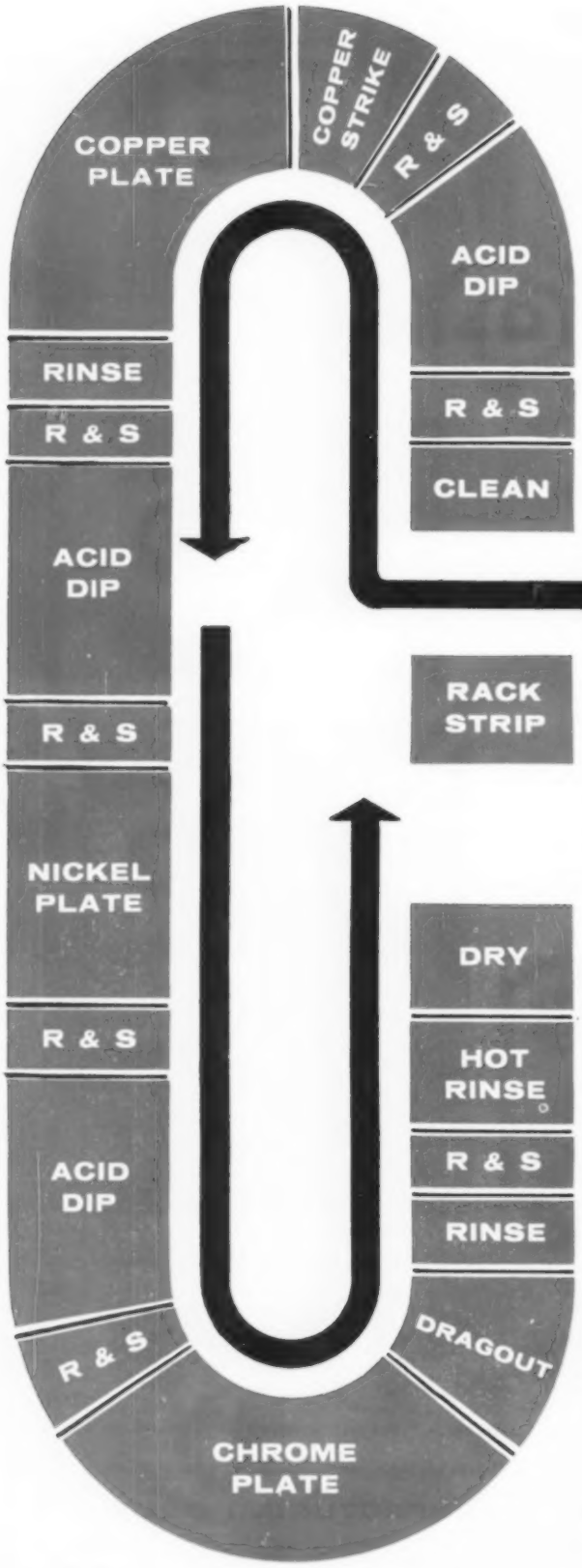

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MEASUREMENT AND AUTOMATIC CONTROL OF THE ETCHING STRENGTH OF FERRIC CHLORIDE

by WILLARD N. GREER*

INTRODUCTION

ALTHOUGH MASS PRODUCTION in the etching of printed-circuit boards is a complex operation, it can be performed simply, economically and with a high degree of quality through the use of an oxidation-reduction control system.

Usually, the production of printed boards for circuits begins with copper foil bonded permanently to a non-conductive laminated panel. The wiring pattern is printed on the copper foil with a chemical-resistant coating. When passed through a continuous series of etching baths, the unwanted parts of the copper foil are etched away—leaving the required electrical circuit.

The problem encountered in this process is that of controlling the rate of oxidation of the copper foil in the etching baths. Generally, the oxidizing condition of the baths is controlled by the addition of ferric chloride solution, and this addition is critical. Too much ferric chloride added to the bath causes over-etching of the copper baths, whereas too little does not remove material quickly enough.

One unique solution to the control problem is an instrumentation system which continuously maintains the proper oxidizing condition but is unaffected by salts or other contaminants that could possibly introduce a measurement error. This is accomplished by a modern technique utilizing the measurement of oxidation-reduction potentials.

THEORETICAL CONSIDERATIONS

The reaction by ferric chloride in the etching of copper is:

$$Cu + 2Fe^{+++} \rightarrow Cu^{++} + 2Fe^{++} \qquad \text{(Eq. 1)}$$

In the oxidation-reduction reaction, the ferric ion is reduced to ferrous ion, and the metallic copper is oxidized to cupric ion.

As the etching process continues, the ferric content (etching power) tends to decrease, with a corresponding increase in the ferrous ion and cupric ion content of the bath. With proper feed of ferric chloride to a continuous cascade overflow system, the cupric ion and ferrous ion content in the various baths will tend to reach a constant level. To maintain a desired etching power in this system, it is then only necessary to maintain a fixed ratio of ferric to ferrous ion concentration.

In the conventional redox electrode system, a calomel reference electrode and a platinum measuring electrode measure the potentials. The potential relation is:

$$E = E_o + 0.059 \log \frac{[Fe^{+++}]}{[Fe^{++}]} \text{ (at 25 C)} \qquad \text{(Eq. 2)}$$

The value of E_o is the potential of the system when the concentrations of ferric and ferrous ions are equal. When using the calomel reference electrode, the E_o value is 0.526 volt. The equation then becomes:

$$E = 0.526 + 0.059 \log \frac{[Fe^{+++}]}{[Fe^{++}]} \qquad \text{(Eq. 3)}$$

In normal etching solutions, the extreme ratio of ferric to ferrous ions might vary as much as 4 or 5 to 1. These variations would produce a significant change in potential of 40 to 50 millivolts in measured values of about 500 millivolts. A change of 0.3 ounce of copper per gallon corresponds, then, to a change of about one per cent in the measured potential.

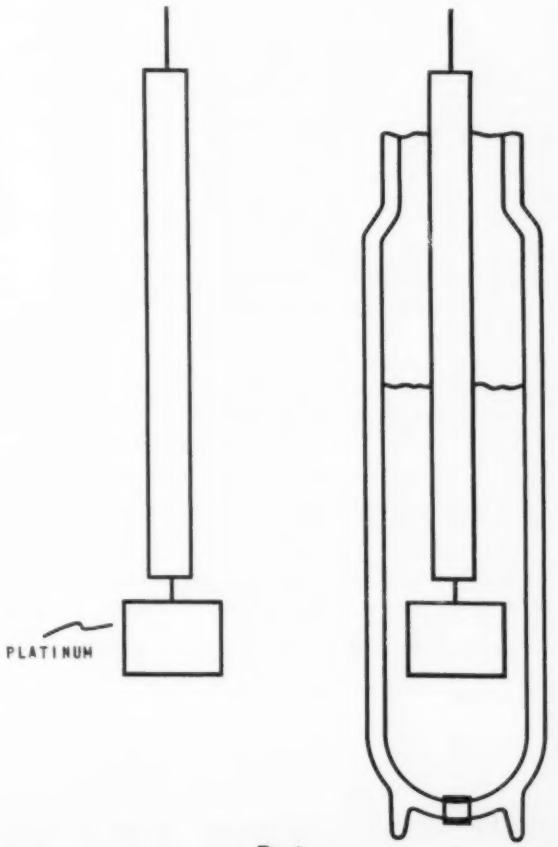

Fig. 1

* Senior Consultant, Analytical Instruments, Leeds & Northrup Company, Philadelphia 44, Pa.

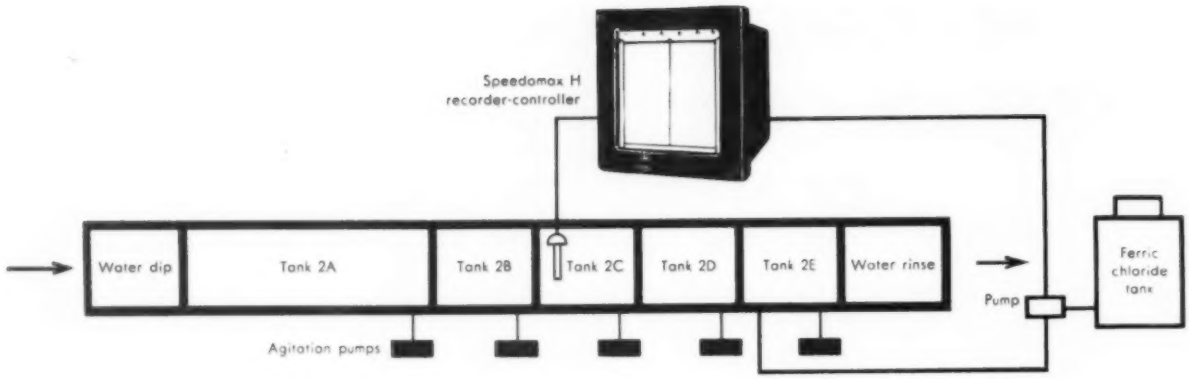

Fig. 2

SOLUTION TO PROBLEM

By using a special technique it is possible to devise a reference electrode system whereby the voltage change of about 50 millivolts occurring in the bath is obtained as the measured voltage over a total range of only 0–50 millivolt. This results in a corresponding increase in detectability. This special technique utilizes a reference electrode comprising a platinum element immersed in a bridge-tube filled with ferric chloride solution that has been reacted with a known quantity of copper (Fig. 1). The concentration of the ferric chloride solution used should be the same as that of the solution to be fed to the bath. Thus we obtain a reference having a known ferric-ferrous ratio and a known copper content. When such a reference electrode is immersed in a bath solution of the same content, the potential difference between it and the platinum measuring electrode is zero. At other bath concentrations, the potential changes as a function of:

$$0.059 \log \frac{[Fe^{+++}]}{[Fe^{++}]} \text{ (at 25C)}$$

PLANT APPLICATION

The following conditions will prevail if the supply of the ferric chloride solution is 30Bé, or a 2.37 molar solution. When this reacts with two ounces of copper, the resulting solution is 1.9 molar ferric and the ferrous content becomes 0.47 molar. Using a sample of this solution as the reference, the reference potential at 135F operating temperature is:

$$E = 0.0677 \log \frac{1.9}{0.47} = 0.0406 \text{ volt} \qquad \text{(Eq. 4)}$$

In solutions of varying copper content, the potentials between this reference and the measuring electrode at 135F are:

Ounces of Copper Per Gallon	Potential in Millivolts
2.0	0.0
2.5	8.1
3.0	15.4
3.5	22.1
4.0	28.3
4.5	34.3
5.0	40.0

Byers and Pinkerton[1] have published similar data on 38 Bé ferric chloride on batch etchings of photoengravings.

MEASUREMENT AND CONTROL

The processing of printed-circuit boards through a continuous line can be a simple operation. Merely by measuring and automatically controlling the solution strength in the baths, uniform production with a minimum of rejects can be easily obtained.

One example of how this is now being accomplished is illustrated in Fig. 2. The flow of etching solution is countercurrent to the flow of the work load. The replenishing supply of 30Bé ferric chloride is automatically added at tank 2E using a proportioning pump and overflows from this tank to tank 2D. This overflow continues from tank to tank until it leaves 2A and goes down the drain. An oxidation-reduction recorder-controller,* which is responsive to the electrode system mounted on tank 2C, actuates the pump. Temperature of the bath and the cycle time are both controlled.

In this system, by having good agitation provided by circulating pumps, an essentially constant load, and an oxidation-reduction controller which is responsive to changes of about 0.2 millivolt, a high degree of precision in the control of etching is obtained.

REFERENCE

[1]Byers and Pinkerton, Proceedings T.A.G.A. (1956) p. 81.

*Leeds & Northrup "Speedomax."

Dr. Willard N. Greer received his Doctorate from Clark University in 1924. After instructing for a year at the University of Maine, he joined the research department of Leeds & Northrup. For 35 years, Dr. Greer has held numerous positions in the marketing and engineering departments of the company. At present, he holds the title of senior consultant, analytical instruments.

Dr. Greer is the author of numerous papers on the application of electrochemical measurements to industrial processes. He is a member of the T.A.P.P.I, American Chemical Society, and a life member of the American Water Works Association.

LEA PLASTICS

ABRASIVE FINISHING METHODS

THERMOPLASTIC & THERMOSETTING

CASTINGS · MOLDINGS · THERMOFORMINGS · FABRICATION

Although most molded or cast plastic parts do not require buffing or polishing because of improvements in mold design, some do require removal of flash, parting lines, sprue projections, gates and imperfections from areas which may need further surface finishing. Articles cut and machined from cast or extruded sheets, rods, and tubes most generally need abrasive finishing to bring machined surfaces back to their original color using sanding, polishing, buffing and coloring operations.

SANDING...Heavy flash removal, sprues, flat surfacing and beveling on **thermosetting** and **thermoplastic** articles is usually done with wet belt sanding. Special waterproof abrasive belts are most generally used. Selection of grit size depends upon the thickness of the flash or sprue to be removed.

POLISHING OR WHEEL SANDING...On **thermosetting** plastic articles, flexible polishing wheels prepared with a coating of **Lea greaseless compound** provide a dry and resilient abrading face for removal of light or residual flash, surface imperfections, marks from cutting tools, and smoothing out irregularities on the contours left by belt sanding.

Thermoplastic articles which readily distort with frictional overheating must be handled with a minimum of pressure of the work against the **Lea Compound** coated buff and at lower peripheral speeds. Further insurance against overheating of the **thermoplastic** can be provided with a light top dressing of **Lubar** or **Learok** over the dried out head of **Lea Compound.**

ASHING...Wet ashing operations on **thermosetting** plastic articles have almost entirely been supplanted by flexible polishing with **Lea greaseless compound.**

Wet ashing operations in some cases are still necessary on **thermoplastic** articles, where a wet sanding belt or **Lea Compound** operation cannot touch areas with certain imperfections. Fundamentally, wet ashing is a dirty operation and parts must be washed and dried before they can be taken to subsequent buffing operations.

BUFFING...Buffing is usually divided into cut-down and lustre buffing or waxing. Cut-down buffing produces a semi-gloss finish from the dull, sanded surface resulting from belt sanding, the **Lea Compound** operation or wet ashing procedure. This semi-gloss finish is usually adequate as a final finish in some cases. Where a higher color is required, this cut-down buffing is the intermediate operation prior to the final high lustre buffing.

LEA ABRASIVE COMPOUND RECOMMENDATIONS FOR PLASTIC FINISHING

OPERATION	THERMOPLASTIC	THERMOSETTING
Sanding	#50 to #400 grit Wet Belt	#50 to #400 grit Wet Belt preferred (May be dry).
Polishing or Wheel Sanding	Grade C or B31 Lea Compound. Dried out head lubricated with Lubar No. 4 or Learok 155.	Grade C or B31 Lea Compound. Lubrication may not be necessary.
Ashing	Grade C or B31 Lea Compound. Lubricate dried out head with Learok 155 or Lubar No. 4.	Grade C or B31 Lea Compound.
Satin Finishing	Grade R or S Lea Compound lubricated with Learok 155.	Grade FG or Q Lea Compound or other coarser grades.
Cut-Down	Learok 155, 765, 843, 855 or 857.	Learok 306, 307A or 857.
Cut & Color	Learok 304, 832 or 881.	Learok 304 or 882K.
Color	Learok 884 or 884E.	Learok 887E.
High Color	Learok 339 or 888.	Learok 339.
BUFFS AND PERIPHERAL SPEEDS		
	THERMOPLASTIC	THERMOSETTING
BUFFS	For Polishing and Ashing...Contour of article and amount of plastic removal determines selection of buffing wheels to use in any of the following types—compress canvas wheel, sewed buff, ventilated or pocketed buff or loose buff. For Satin Finishing, Cut-Down, Cut & Color, Coloring and High Coloring Operations...selecting pocketed or ventilated type, sewed, loose muslin, packed muslin or canton flannel buffs, depends upon hardness of plastic, contour of the article and final finish desired.	
SPEEDS	3000 to 5000 surface feet per minute	4000 to 6000 surface feet per minute

PLASTIC LAMINATES

On surfaces of plastic laminates where fibrous fillers are completely covered with either a **thermoplastic** or **thermosetting** plastic, polishing and buffing recommendations are the same as given for the particular plastic binder involved.

When fibrous fillers are thoroughly impregnated, cut edges may be sanded, cut down and colored readily with the recommended compositions above. When the fibres of the filler are long, hard and not impregnated, i.e., fiberglass laminates—polishing operations on the edges with **Lea Compound** can be done successfully, but buffing to a high lustre is difficult because the long, hard fibres protrude and make it difficult to cut down and to produce a flat lustrous surface.

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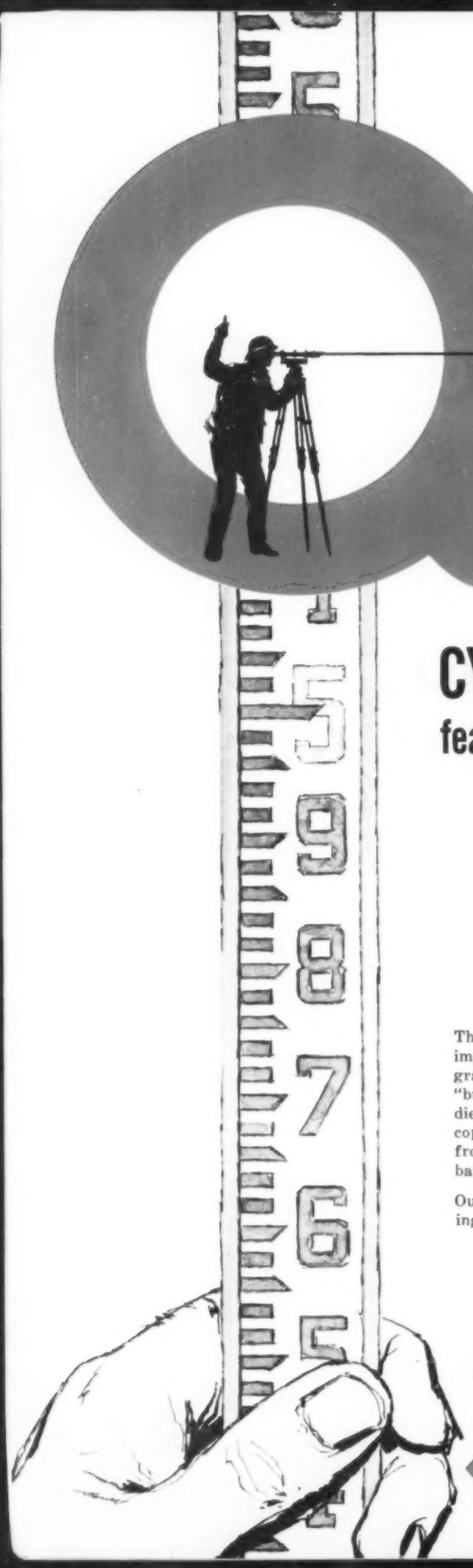

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PRELIMINARY INVESTIGATION OF THE EFFECT OF BRIGHTENING ADDITIONS IN NICKEL SULFATE SOLUTIONS

by R. J. KENDRICK*

ABSTRACT

The results of a preliminary investigation into the brightening effects of individual organic additions and of nickel sulfide on nickel deposited from a standard Watts solution are reported. Evidence is provided that brightness increases with the distance between functional groups on the naphthalene molecule. Preferred orientation was not a consistent feature of deposits produced from solutions containing a single brightener and while some bright deposits showed preferred orientation others were completely random.

INTRODUCTION

THE EXACT MECHANISM whereby organic additions to electroplating baths cause deposits to become bright is still not fully known. Several suggestions have been advanced but no single one appears completely to agree with all of the observed facts, and when the very complex nature of the problem involved is taken into consideration this is perhaps not surprising. Nevertheless, the progress so far made has provided sufficient fundamental information to enable research to progress on less empirical lines than in the past, but further systematic study will have to be undertaken before the performance of brighteners can be accurately predicted from a knowledge of their constitution and structure.

In an attempt to shed further light on this problem the relationship between constitution and structure for a series of related organic compounds on their brightening effects in Watts nickel sulfate plating solutions has been examined. Up to the present, this study has been confined to the effects of the position of sulfonate radicals alone and in relation to NH_2, OH, CH_3, and CH_2CH_2 groups in compounds based on benzene and on naphthalene, but extension to further compounds is envisaged. Pamfilov and Panchuck[1] have observed that for the naphthalene sulfonic acids, those in which the sulfonic groups are the greatest distance apart give the brightest nickel deposits. Rapson[2] referring to the effect of addition agents in acid tin plating baths, suggests that the position of the OH group in dihydroxydiphenylmethanes may be related to the extent of the smoothing action they can exert on the deposit. There is thus reason to examine further these effects of structural variation in organic compounds and the work herein reported is mainly concerned with this approach to the problem of their brightening action.

Most of the variables of the process of electrodeposition can influence the brightness of the cathode deposit to some extent, and when studying the brightening effects of addition agents it is therefore advisable to standardize and maintain one set of conditions. In this investigation the basis metal, its physical structure and surface preparation, temperature of deposition, *p*H, current density, degree of agitation, thickness of deposit, bath composition, dimensions of the plating cell and, with certain exceptions, concentration of addition agent were all kept constant. Remaining factors that might still influence the brightness of the deposit are the brightness of the substrate and variations in the roughness of the deposit itself. The results obtained from the first series of deposits prepared were analyzed statistically to determine whether variations in these latter factors had any significant effect on the measured brightness.

X-ray analyses were undertaken to ascertain whether the addition agents had any effect on the orientations of the deposits.

EXPERIMENTAL PROCEDURE

Plating Bath—A standard Watts type bath was employed of the following composition: $NiSO_4 \cdot 6H_2O$ 300, $NiCl_2 \cdot 6H_2O$ 60, and H_3BO_3 38 g/l. Bulk solutions were prepared from commercial purity materials and purified by treatment with 200 cc/l of activated charcoal to remove organic contamination; metallic impurities were plated out by working the solution overnight at 1 asf. To ensure maximum reproducibility in the physical properties of the deposit[3] electrodeposition was undertaken at 40 asf until at least 40 ampere-hours per litre had passed. Replenishment of nickel was effected by using sheet-nickel anodes (approx. 99.3 per cent Ni) enclosed in nylon bags. The *p*H was adjusted to 4 ± 0.1 by adding dilute sulfuric acid or by working the solution at very high current densities using a fine copper wire cathode.

Plating Cell—The cell was made from perspex. The anodes were welded to a nickel support and were located in slots near one end of the cell. They were encased in nylon bags, previously leached in warm distilled water and changed for each new addition agent. Cathodes were suspended from nickel-plated clips with 2.25 in. dimension and scratch lines vertical; they were stopped off on the backs. Agitation was effected by horizontal oscillation of the cathode through a distance of one inch at a frequency of 200 strokes per minute. Extension pieces were incorporated in the framework of the agitator to maintain a constant spacing between the anode and cathode. The plating cell was heated by an external water bath thermo-

*Postgraduate student, Department of Metallurgy, University of Nottingham, England.

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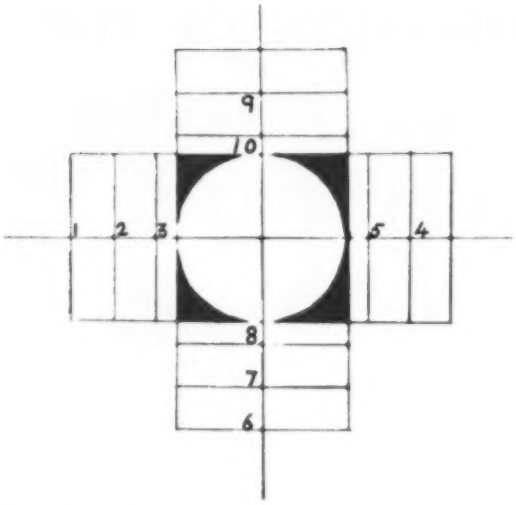

Fig. 1. Paper grid superimposed on sole plate of reflectometer. End of specimen is moved along the numbered grid lines.

statically controlled to maintain temperature of the electrolyte at 40 ± 1 C.

The basis metal was prepared from O.F.H.C.* copper sheet, suitably heat treated. X-ray analysis indicated the absence of preferred orientation or recrystallisation texture in the cathode material, consequently any orientation effects observed in the deposit were assumed to result from the deposition processes and not from the substrate. The cathodes measured 2.25 by 1 by 0.025 in. They were blanked out, mounted in a specimen holder, and finished on 000 grade emery paper, precautions being taken to ensure that the scratch lines thus produced ran in the longitudinal direction. Clinging fragments of copper and emery powder were removed by a water jet and after stopping off on the unpolished face the specimens were electrolytically degreased in an alkaline solution. Plating was at a current density of 40 asf and the thickness of nickel deposited was 0.001 in.

Addition Agents—Whenever possible the purified sodium salts of the compounds studied were used because they generally had a greater solubility than the free acids and were also the more readily available. With two exceptions approximately constant molar concentrations of 4×10^{-3} M were standardized. The first exception was naphthalene disulfonic acids where only the 1, 5 and 2, 7 isomers were available and results were repeated at 3.0×10^{-2} M concentration. The second was when a nickel sulfide suspension was used. This compound was finely powdered, washed several times with carbon disulfide to remove sulfur, and dried at 110C. A concentration of 7.4×10^{-5} M was dispersed using ultrasonic agitation to give a suspension. Four specimens were obtained from each bath containing an addition agent.

Determination of Brightness—The total reflectivity, T, and brightness S/T, of each specimen, where S is the specular reflectivity, were assessed using an inverted Guild reflectometer.[4] A thin paper grid was superimposed on the sole plate of the instrument and it was possible by moving the cathode along the grid lines to obtain ten values for each specimen. (Fig. 1). The values were then averaged to give a final assessment for each sample. Deposits plated several months previously gave reproducible results on redetermining the values. As would be expected, none of the deposits were fully bright.

Determination of Surface Roughness—This was measured in one direction only, being that perpendicular to the scratch lines. A Talysurf analyzer was used which records the average roughness in microinches about a center line. Each specimen was mounted in a holder free to move along a channel in a lower block (Fig. 2) which was fixed on the stage of the instrument. The side of the channel was marked so that surface roughness measurements could be estimated on the same areas as the brightness. Four measurements were made on each of the five areas on which brightness had previously been determined, and the 20 readings were then averaged to give a single index. A cut-off wavelength of 0.03 in. was adopted for the Talysurf measurements. Roughness values were obtained for specimens deposited from baths containing sixteen different additions.

X-ray Studies—It was necessary to strip the deposits from the copper substrate to permit them to be examined by transmission and attempts to do so by dissolving the copper in a solution of ammonium persulfate and ammonium hydroxide, which gives satisfactory results in the stripping of dull nickel deposits,[5] were not successful. This solution caused fairly severe attack of the nickel in deposits obtained from solutions containing naphthalene sulfonic acids. Deposits from solutions containing naphthylamine sulfonic acids were attacked preferentially with respect to the copper, as can be seen in Fig. 3. Satisfactory stripping was ultimately obtained by dissolving the copper in a solution containing 500 g/l of chromic acid and 50 g/l of sulfuric acid.[3] Copper K α radiation was used with no filter, the nickel deposit itself filtering out the majority of the β radiation. The variations in intensities of the (111) and (200) patterns were plotted as pole figures, using stereographic projections.

Experimental Results—The average values for the reflectivity, brightness, and roughness of the first 68 deposits examined are recorded in Table I. Statistical examination of

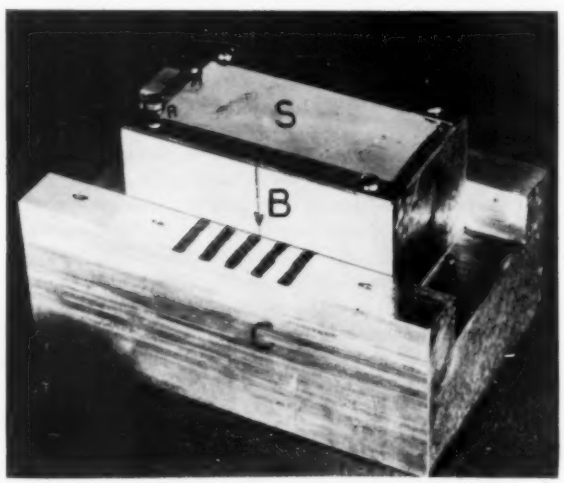

Fig. 2. Specimen holder on talysurf stage. The specimen, S, is placed against the stops, A, on block B and is free to move along a channel in the fixed lower block, C. Roughness values were measured when the scribed arrow corresponding to the position of the talysurf trace was opposite one of the numbered bands on the block C.

*Oxygen-free high-conductivity

TABLE I

AVERAGE VALUES FOR THE EFFECT OF ADDITION AGENTS ON THE TOTAL REFLECTIVITY, BRIGHTNESS, AND SURFACE ROUGHNESS OF ELECTRODEPOSITED NICKEL, AND FOR THE TOTAL REFLECTIVITY AND BRIGHTNESS OF THE SUBSTRATE

Addition Agent Sodium salt of:	Molar Concentration	Total Reflectivity, Per cent		Brightness, Per cent		Roughness of deposit micro-in.	Orientation parallel to substrate
		Substrate	Deposit	Substrate	Deposit		
None	—	46.5	54.5	6.5	1.0	14.0	Fairly strong (100) with slight (111)
Benzene sulfonic acid	4.0×10^{-3}	54.5	57.0	7.0	1.0	15.0	
Benzene-m-disulfonic acid	4.0×10^{-3}	55.0	58.5	6.5	1.0	14.5	
Naphthalene 1 sulfonic acid	4.0×10^{-3}	46.0	66.0	7.0	9.0	13.5	Almost random
Naphthalene 2 sulfonic acid	4.0×10^{-3}	42.0	64.0	9.5	9.5	11.5	Very slight
Naphthalene 1, 5 disulfonic acid	3.0×10^{-3}	48.5	66.5	7.0	13.0	14.5	arcing occurred on
Naphthalene 2, 7 disulfonic acid	3.0×10^{-3}	52.0	66.5	7.5	11.5	13.5	200 reflection
Naphthalene 1, 5 disulfonic acid	4.0×10^{-3}	53.5	67.0	6.0	12.0	15.0	circle at higher
Naphthalene 2, 7 disulfonic acid	4.0×10^{-3}	52.0	66.5	6.0	11.5	13.5	angles; could include (210) or (311)
Naphthalene 1,3,6 trisulfonic acid	4.0×10^{-3}	52.0	67.5	6.0	11.0	14.5	
1 Naphthylamine 2 sulfonic acid	4.0×10^{-3}	52.0	42.5	7.5	0.25	13.5	Completely
1 Naphthylamine 4 sulfonic acid	4.0×10^{-3}	52.5	44.0	7.0	3.5	13.5	
1 Naphthylamine 5 sulfonic acid*	4.0×10^{-3}	53.0	50.0	7.0	9.5	15.0	random
1 Naphthylamine 6 or 7 sulfonic acid	4.0×10^{-3}	52.0	47.0	7.0	2.5	15.0	
2 Naphthylamine 5, 7 disulfonic acid	4.0×10^{-3}	53.0	54.0	6.0	5.0	14.5	Moderate (110)
2 Naphthylamine 6, 8 disulfonic acid	4.0×10^{-3}	52.5	54.5	5.0	6.0	14.0	
Nickel sulfide suspension	7.4×10^{-5}	54.0	54.5	6.0	1.0	16.5	Fairly strong (100) slight (111)

* Free acid.

these results indicated that variations in the surface roughness of the deposit and in brightness of the substrate over the ranges concerned had little influence on measured brightness, and consequently final roughness and initial brightness were not determined in the further tests whose results are reported in Table II. All of the deposits were uniform in appearance with the exception of those obtained from solutions containing naphthylamine disulfonic acids and 1-naphthol monosulfonic acids, where a small band of enhanced brightness extended around the edges of the specimens. This band was quite narrow and did not influence the brightness measurements.

The orientations obtained from the X-ray examinations are also reported in Table I.

Statistical analysis of the results obtained for the brightness of deposits from solutions containing 16 additions and for the straight Watts nickel sulfate solution was undertaken to ascertain what correlation, if any, existed between the brightness of the deposit and that of the substrate and between the brightness and roughness of the deposits. The correlation coefficient, r*, is a number the magnitude of which indicates the degree of association between the variables. When r = o there is no functional relationship and when r = ± 1 the reverse is true. From the computed value of r it is necessary to know whether the coefficient obtained is significant or not by determining the t** value from which the probability, P, of the results arising by chance is indicated in tables.

To establish, or otherwise, the interdependence of substrate brightness and deposit brightness the following values were calculated:

$$r = +0.226$$

from which $t = 1.89$

and from probability tables $0.05 > P > 0.10$

* $$r = \frac{\Sigma\,[B_d - \bar{B}_d]\;[B_s - \bar{B}_s]}{N\sigma_{B_d}\,\sigma_{B_s}}$$

where B_d and B_s are the individual values of brightness of deposit and substrate respectively and $\bar{B}_d$ and $\bar{B}_s$ are the arithmetic mean values. σ_{B_d} and σ_{B_s} are the standard deviations. N is the number of observations.

** $$t = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}}$$

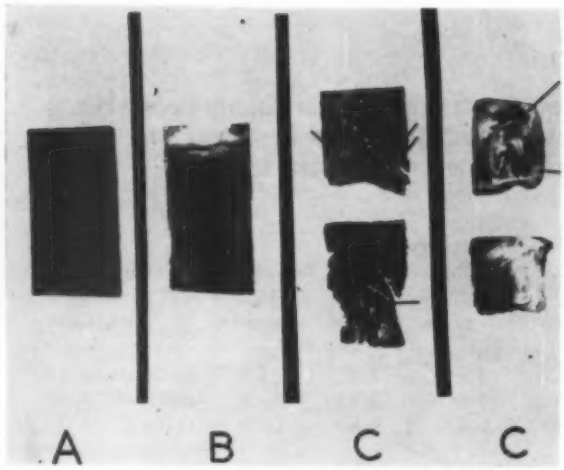

Fig. 3. Variation in the type of attack of nickel deposits in ammonium persulfate solution.

A—Watts nickel. Copper removed, no visible attack of the nickel.
B—Naphthalene sulfonic acid as addition agent. Copper removed, fairly severe perforation attack on the nickel.
C—Naphthylamine sulfonic acid as addition agent. Nickel preferentially attacked leaving islands of nickel, as shown by arrows. Nickel completely dissolved leaving copper substrate, as shown on the lower right hand specimen.

The correlation coefficient here is not significant at the five per cent level, which is perhaps the most frequent level at which statisticians work. In fact $0.05 > P > 0.10$, which means that, on repeated samples of size 68, such a value of the correlation coefficient would occur from between five and ten per cent of occasions if the correlation between B_d and B_s were actually zero. In other words, the evidence that any correlation exists is weak.

The same procedure was then adopted to examine the influence of slight variations in surface roughness within the range measured and the results obtained were

$$r = -0.304$$
$$t = 2.59$$
$$0.02 > P > 0.01$$

The correlation coefficient for this case seems to be significantly different from *zero*, since $0.02 > P > 0.01$. However, it should be added that, though there undoubtedly does seem to be some relationship between B_d and roughness the value of the correlation coefficient is not high.

DISCUSSION

The statistical analysis indicates that variations in substrate brightness and in roughness after plating had little influence on deposit brightness under the prevailing experimental conditions. It thus appears that the only independent variable is the effect of addition agents.

The evidence adduced from the brightness measurements is that the distance between functional groups on the naphthalene molecule is significant and may possibly bear some relationship to the atomic spacing in various planes in the electrodeposited nickel. At the moment this latter suggestion is merely tentative and is prompted by the observation that the addition agents can exert quite a marked effect on deposit orientation. The observed effect on brightness of the distance apart of sulfonic groups in naphthalene disulfonic and trisulfonic acids confirms the work of Pamfilov and Panchuck.[1] The results obtained with naphthylamine sulfonic acids and naphthol sulfonic acids suggests that this positional effect is not restricted to the same functional groups. It is not possible

TABLE II

AVERAGE VALUES FOR THE TOTAL REFLECTIVITY AND BRIGHTNESS OF NICKEL DEPOSITED FROM SOLUTIONS CONTAINING FURTHER ORGANIC ADDITIONS

Addition Agent	Molar Concentration	Reflectivity, Per cent	Brightness, Per cent
Toluene-p-sulfonic acid	4.0×10^{-3}	54.5	1.0
Xylene-p-sulfonic acid	4.0×10^{-3}	54.5	1.0
*p Toluidine 2 sulfonic acid	4.0×10^{-3}	60.5	1.0
*p Toluidine 3 sulfonic acid	4.0×10^{-3}	37.5	0.5
*m Toluidine 4 sulfonic acid	4.0×10^{-3}	58.0	1.0
1 Naphthol 2 sulfonic acid	4.0×10^{-3}	56.0	4.0
1 Naphthol 4 sulfonic acid	4.0×10^{-3}	56.5	5.0
1 Naphthol 5 sulfonic acid	4.0×10^{-3}	41.5	6.0
2 Naphthol 1 sulfonic acid	4.0×10^{-3}	59.0	1.0
2 Naphthol 6 sulfonic acid	4.0×10^{-3}	57.5	4.5
1 Naphthol 3, 6 disulfonic acid	4.0×10^{-3}	52.0	1.5
2 Naphthol 3, 6 disulfonic acid	4.0×10^{-3}	59.0	3.5
**2 Naphthol 6, 8 disulfonic acid	4.0×10^{-3}	55.0	1.0
Toluene-p-sulfonamide	4.0×10^{-3}	67.0	9.5

* Free acids.
** Potassium salt.

at this stage to explain the differences between the behaviour of benzene sulfonic acids and naphthalene sulfonic acids; the former had no effect on brightness but gave a slight increase in total reflectivity. Various anthracene sulfonic acids have been synthesised in an attempt to compare the effect of variation in the number of benzene rings but initial difficulties have been encountered with these compounds owing to their low apparent solubility in a Watts nickel solution; nevertheless, they have exerted a definite brightening effect. Toluene and xylene-p-sulfonic acid had no effect and the toluidine-p-sulfonic acids, although giving slight increases in total reflectivity, did not increase brightness. With the latter compounds possible internal salt formation occurred rendering the functional groups inoperative.

Pamfilov and Panchuck[7] advance the following mechanism to explain the reduction of naphthalene sulfonic acids in nickel sulfate plating solutions.

$$C_{10}H_7SO_3H \xrightarrow{H} C_{10}H_7SO_2H \xrightarrow{H} C_{10}H_7SH \xrightarrow{Ni} C_{10}H_8 + NiS$$

The nickel sulfide thus produced would be expected to form on the cathode and hence any brightening effect resulting therefrom is not legitimately comparable with possible similar effects when the nickel sulfide is present as a suspension. In the present investigation suspended nickel sulfide has been shown to exert no effect.

Finch and Layton[8] have discussed the conditions that favour outward or lateral growth of an electrodeposit. In practical electrodeposition the preference is nearly always for a mode of growth that is predominantly lateral, and the conditions under which most plating processes are operated generally favour lateral spreading. In the case of normal nickel deposits the octahedral planes (111), being the most closely packed, would thus be expected to lie parallel to the substrate. Lateral growth in nickel is not, however, thus characterized. Goswami[9] has shown that in addition to the (111) planes the slightly less close packed (100) planes may be parallel to the substrate and in fact other workers have demonstrated that the latter orientation usually predominates in nickel deposits.

The orientations of the deposits obtained from solutions containing addition agents are given in Table I and it will be seen that they are affected by most of the additions examined. The normal orientation, characteristic of the addition-free solution, is retained only for the benzene sulfonic acids and nickel sulfide additions. The most striking effect of most of the other additions is their tendency to destroy preferred orientation in favour of a more or less random arrangement. Attention is particularly drawn to the group of four additions that produced a completely random orientation. Brightness varied very greatly within this group and although the presence of preferred orientation has often been stated to be characteristic of bright electrodeposits, and indeed possibly to be a factor contributing to their brightness, these observations provide no support for this contention. They must not, however, be regarded as disproving it in general terms; at this stage it would be much safer to regard these particular results as specific for the additions to which they apply. They certainly clearly emphasise the effect of the position of groups attached to the benzene rings of the addition agent molecules in deposit brightness, to which attention was drawn earlier in this report. At least for some other electrodeposited metals, it seems that adsorbed hydrogen can cause interference during crystal growth and lead to a random orientation.[8] If hydrogen is responsible for the random distribution found in many of the present deposits it is difficult to understand why it should not exert its influence for all of the additions and why the mere presence of an organic addition should favour its adsorption. It is considered much more likely that the effect is associated with adsorption of the addition agent itself, or of some product resulting from its breakdown at the cathode.

The (110) orientation observed for deposits from baths containing naphthylamine disulfonic acids suggests that the favoured direction of growth in this case may be outward rather than lateral.

CONCLUSION

Much more work will have to be done before a clear picture of the mechanism of brightening by addition agents can be fully explained. So far, brightness only has been studied and levelling action will have to be considered but before doing so it is intended to investigate more fully the actual way in which organic additions convert a dull deposit into a bright one. Slow, systematic study is the only approach to this problem, and it is felt that insufficient information on the basic problem has yet been obtained to justify extension of the work in the direction of the study of levelling action. The importance of the latter is not being underestimated.

ACKNOWLEDGMENT

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CYANOAURATE (III) ELECTROPLATING BATHS, THEIR CHEMISTRY, PREPARATIONS AND SOME PHYSICAL PROPERTIES

by ANTON F. MOHRNHEIM*

ABSTRACT

Metallic gold can be deposited from the tetracyanoaurate (III) ion complex. Its basic chemistry is shown and explained by chemical equations. Successful plating baths of this type are described.

INTRODUCTION

THE HANDBOOKS AND TREATISES on electroplating known to the writer describe in detail the electrodeposition of gold from plating baths containing dicyanoaurate(I), $Au(CN)_2^-$, in which the gold is in the +1 oxidation state. Sometimes only vague references are made to the "ferrocyanide or yellow prussiate gold plating bath", the chemistry of which has been admittedly little understood and therefore has not been explained explicitly. In the following, this bath and a related one are described. Both contain the tetracyanoaurate(III) complex ion, $Au(CN)_4^-$, in which the gold is in the +3 oxidation state, as shown by chemical equations which will be suggested. While the yellow prussiate gold plating bath has been used for generations, the related bath is rather new and, to the writer's knowledge, has not been reported in literature.

Cyanoaurate(III) anions are obtained by neutralizing chloroaurate(III) acid, $HAuCl_4$, and adding either ferrocyanide or cyanide. The role of potassium ferrocyanide (yellow prussiate, $K_4Fe(CN)_6 \cdot 3H_2O$) in an ancient and quite successful type of gold plating bath has been investigated and described by the writer.[1] The reaction occurring when cyanide, instead of yellow prussiate, is added, is analogous as shown in this article. Plating baths prepared by this method are equally successful.

Chloroauric(III) acid is most conveniently obtained by dissolving gold in aqua regia. For the latter usually a mixture is recommended which consists of 1 part by volume of concentrated nitric acid as oxidizing agent and three to four parts by volume of concentrated hydrochloric acid as complexing agent. The amount of aqua regia to be used is sometimes given as high as 20 times the weight of gold to be dissolved. The excessive acids have to be evaporated after the dissolution and considerable losses of gold during this process may occur due to the low vapor pressure of the gold(III) chloride which sublimes in chlorine at 265C.

The writer has found that aqua regia reacts quantitatively with gold if a distilling apparatus is used and the reaction is enhanced by heating, preferably in an oil bath. In order to show the amount of reactants, the chemical reactions occurring are suggested in the following equations; stoichiometric computations are also given for the over-all reaction.

PREPARATION OF CHLOROAURIC(III) ACID

The dissoluton of gold in aqua regia can be described in four steps,

1. The production of chlorine in aqua regia:
$$4H_3O^+ + 3Cl^- + NO_3^- = Cl_2 + NOCl + 6H_2O \qquad \text{Eq. 1}$$
(Nitrosylchloride, NOCl, contradictory to earlier beliefs, does not react with the gold.)

2. The reaction of chlorine with metallic gold to produce claret-red gold(III) chloride:
$$3/2\ Cl_2 + Au = AuCl_3 \qquad \text{Eq. 2}$$

3. The rapid dissolution of gold(III) chloride in water forming the brown-red complex, trichlorooxogold (III) acid, $H_2[AuCl_3O]$:
$$AuCl_3 + H_2O = H_2[AuCl_3O] \qquad \text{Eq. 3}$$

4. The reaction of trichlorooxogold(III) acid with hydrochloric acid to form lemon yellow chloroauric(III) acid, $H[AuCl_4]$:
$$H_2[AuCl_3O] + HCl = H[AuCl_4] + H_2O \qquad \text{Eq. 4}$$

The over-all equation for dissolving gold is then:
$$Au + 6H_3O^+ + 11/2\ Cl^- + 3/2\ NO_3^- \rightarrow AuCl_4^- + 3/2\ NOCl + 9H_2O \qquad \text{Eq. 5}$$

Using hydrochloric acid and nitric acid this equation becomes:
$$Au + 11/2\ HCl + 3/2\ HNO_3 \rightarrow HAuCl_4 \cdot 3H_2O + 3/2\ NOCl \qquad \text{Eq. 6}$$

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TABLE I

WEIGHTS AND VOLUMES OF REACTANTS AND PRODUCTS PRODUCING CHLOROAURIC(III) ACID, (Cf. Eq. 6)

Formula	Reactants			Products	
	Au	HCl	HNO_3	$HAuCl_4 \cdot 3H_2O$	NOCl
Formula Weight	197.0	36.46	63.02	393.88	65.45
Number of Moles	1	11/2	3/2	1	3/2
Total Weight	197.0	200.53	94.53	393.88	98.18
Equivalent Grams for 1 Troy Oz Au	31.10	31.66	14.92	62.18	15.50
Equivalent Grams of Lab. Reagent		85.57	21.31		
(Assay, Per Cent)		(37.0)	(70.0)		
Equivalent Volumes, cc		71.91	15.01		
(Sp. Gr. of Reagent)		(1.19)	(1.42)		

Table I shows the stoichiometric amounts involved in this equation and the equivalent weights and volumes of customary laboratory acids reacting with one ounce of gold. The weight of one troy ounce (20.0 pennyweights = 31.10 grams) was chosen since it is the practical trade unit for gold in the United States and the Commonwealth; otherwise, the writer gives preference to the metric system in accordance with modern laboratory and plating practices.

By using the stoichiometric amounts shown in Table I, excess acids do not have to be evaporated; practical and economic advantages are gained.

NEUTRALIZATION (HYDROLYSIS) OF CHLOROAURIC(III) ACID

When hydroxide is added to chloroauric(III) acid, the chloride ions will be replaced by hydroxide ions. The latter have a stronger complexing power than chloride. The replacement proceeds in 4 steps for which the following hydrolysis constants, K_1 to K_4, have been given:[2]

$$AuCl_4^- + OH^- = AuCl_3OH^- + Cl^-;\ K_1 = 10^{-6.07}$$
$$AuCl_3(OH)^- + OH^- = AuCl_2(OH)_2^- + Cl^-;\ K_2 = 10^{-7.00}$$
$$AuCl_2(OH)_2^- + OH^- = AuCl(OH)_3^- + Cl^-;\ K_3 = 10^{-8.06}$$
$$AuCl(OH)_3^- + OH^- = Au(OH)_4^- + Cl^-;\ K_4 = 10^{-8.51}$$

The change from the chloride complex to the hydrolized form is shown in concentrated solutions by a marked change in color from yellow to dark-brown. This color change may serve as an indicator that the neutralization has been completed. Ferrocyanide can now be added without getting a "prussian blue" precipitate,[1] or cyanide can now be added without the development of the extremely poisonous hydrocyanic acid. Addition of excess alkali hydroxide (or alkali carbonates which will perform similarly when heated) is not critical but is advisable as a matter of precaution. The cyanide ion is a stronger complexing agent than the hydroxide and chloride ions and will replace both. However, the hydroxide ion concentration should not reach the point of completion of the fourth step of hydrolysis (pH = 8.51) where tetrahydroxoaurate(III) will be formed and the yellow-brown precipitate, gold(III) hydroxide or auric acid, may be formed.

PREPARATION OF CYANOAURATE(III) SOLUTIONS FROM FERROCYANIDE

The cyanoaurate(III) anion is obtained by adding hydroxide and ferrocyanide to chloroauric(III) acid. The reactions occurring have been suggested in an earlier paper.[1] The overall reaction is expressed in the following equation:

$$6HAuCl_4 + 14OH^- + 4\ Fe(CN)_6^{4-} + O_2 \rightarrow$$
$$6\ Au(CN)_4^- + \underline{4Fe(OH)_3} + 24Cl^- + 4H_2O \qquad \text{Eq. 7}$$

When the potassium salts, potassium hydroxide (KOH) and potassium ferrocyanide ($K_4Fe(CN)_6 \cdot 3H_2O$) are used, this equation becomes:

$$6HAuCl_4 \cdot 3H_2O + 14KOH + 4K_4Fe(CN)_6 \cdot 3H_2O + O_2 \rightarrow$$
$$6KAu(CN)_4 + \underline{4Fe(H_2O)_3(OH)_3} + 24KCl + 22H_2O \qquad \text{Eq. 8}$$

The brown-red precipitate formed is hydrated iron(III) hydroxide, and is removed from the solution by filtering. The reaction proceeds quantitatively. If the stoichiometric amounts of reactants shown in Table II are employed, no

TABLE II

WEIGHTS OF REACTANTS TO PRODUCE POTASSIUM CYANOAURATE(III)

Formula	$HAuCl_4 \cdot 3H_2O$	KOH	$K_4Fe(CN)_6 \cdot 3H_2O$	O_2
Formula Weight	393.88	56.108	422.412	32.000
Number of Moles	6	14	4	1
Total Mole Weight	2363.28	785.51	1689.65	32.00
Equivalent Grams for 1 Troy Oz Au	62.18	20.67	44.46	0.84

TABLE III

WEIGHTS OF REACTION PRODUCTS OF THE POTASSIUM CYANOAURATE(III) SOLUTION

Formula	$KAu(CN)_4$	$Fe(H_2O)_3(OH)_3$	KCl	H_2O
Formula Weight	340.176	160.918	74.557	18.016
Number of Moles	6	4	24	22
Total Mole Weight	2041.06	643.67	1789.36	396.35
Equivalent Grams for 1 Troy Oz Au	53.70	16.94	47.08	10.43

free cyanide will be present in the solution and the solution can be used for plating within a *p*H range from slightly acidic to mildly basic.

As pointed out earlier,[1] the old name, "yellow prussiate or ferrocyanide gold plating bath" is a misnomer since the yellow prussiate is not essential for plating and is, in fact, not present when the stoichiometric amounts of reactants suggested by equation 8 and shown in Table II are employed.

Other alkali salts or amounts of gold can be used, of course, but then the required amounts must be changed in proportion; the Proportion Principle of the slide rule for such calculations is most useful and is recommended.

Table III shows the weights of reaction products of equation 8.

Since practical electrodeposition of gold is preferably done from very dilute gold solutions, deionized water is added to the concentrated solution containing 1 troy ounce of gold to make up 31.1 liters (8.2 gallons) of plating bath. The concentration of the gold in this bath will then be one gram of gold per liter (1g Au/l) or 1.73 grams of potassium cyanoaurate(III) salt per liter (1.73g $KAu(CN)_4$/l) or, expressed in molarity, five millimolar (mM). This concentration has been found to perform very satisfactorily after adding suitable salts to improve the conductivity and to act as buffers and as brighteners.

The effect of adding various amounts of different salts have been investigated. Table IV shows a mixture of salts and their optimum concentrations in the plating bath which were determined using the Hull cell plating technique.

Besides the added salts in Table IV, 47.08 grams of potassium chloride per 1 troy ounce of gold are present in the solution which was formed during the preparation of the bath (Cf. Table III). This corresponds to 1.5 grams of potassium chloride per liter of diluted plating bath or, in molarity, a 20 millimolar solution. The bath performs best at around 70 degrees Centigrade (approx. 160F). Stainless steel anodes were used. No anodic attack on the stainless steel anodes was evident using the dilute bath in the laboratory. In actual production plating in a jewelry chain shop where the plating tank of stainless steel has been used as the anode, some minor pitting of the tank, assumably due to the chloride ions present, was observed after a period of more than 1 year plating (8 hours per working day).

The addition of a wetting agent to the bath is not required for successful plating. However, it has been found that 3 ml of Turkey Red Oil, 50 per cent (sulfonated castor oil) per liter of diluted plating solution depress the surface tension of the bath from 60 dynes/cm to 30 dynes/cm and are beneficial by producing a still finer grained deposit with increased corrosion resistance. Other wetting agents like commercial Lux household detergent act similarly at approximately the same concentration but may cause some turbidity in the plating bath. Higher concentrations of Turkey Red Oil in the bath will not further decrease the surface tension appreciably, but did not appear to be harmful.

PREPARATION OF CYANOAURATE(III) SOLUTIONS FROM CYANIDE

By neutralization of the chloroaurate(III) acid and addition of cyanide, the cyanoaurate(III) is formed in accordance with the following equation:

$$HAu(Cl)_4 + OH^- + 4CN^- \rightarrow Au(CN)_4^- + 4Cl^- + H_2O \qquad \text{Eq. 9}$$

TABLE IV

ADDITION SALTS TO CYANOAURATE(III) PLATING BATH

Salts	g/l	Concentrations g/troy oz Au	Molarity, mM
Potassium Bicarbonate, $KHCO_3$, F. W. 100. 119	15	466.5	150
Potassium Phosphate, dibasic, K_2HPO_4, F. W. 174. 183	5	155.5	29
Potassium Sulfite, K_2SO_3, F. W. 158. 266	2	62.2	13

TABLE V

WEIGHTS OF REACTANTS AND PRODUCTS TO PRODUCE POTASSIUM CYANOAURATE(III)

Formula	Reactants			Products		
	$HAuCl_4 \cdot 3H_2O$	KOH	KCN	$KAu(CN)_4$	KCl	H_2O
Formula Weight	393.88	56.12	65.12	340.18	74.56	18.016
Number of Moles	1	1	4	1	4	4
Total Mole Weight	393.88	56.12	260.48	340.18	298.24	72.06
Equivalent Grams for 1 Troy Oz Au	62.18	8.86	41.12	53.70	47.08	11.38

When using potassium salts, potassium cyanoaurate(III), potassium chloride, and water are formed:

$$HAuCl_4 \cdot 3H_2O + KOH + 4KCN \rightarrow KAu(CN)_4 + 4KCl + 4H_2O \qquad \text{Eq. 10}$$

This reaction also proceeds quantitatively. When the stoichiometric amounts of reactants shown in Table V are used, no free cyanide will be present and the solution is essentially neutral.

PERFORMANCE OF THE CYANOAURATE(III) PLATING BATHS

The same dilution, addition salts and working temperature as described above for the plating bath prepared from yellow prussiate are applicable to the plating bath prepared from cyanide. Figure 1 shows the results of two Hull cell platings using the method described by Ostrow and Nobel.[3] The weights of the deposited gold platings (the thicknesses have been calculated) vs. the large range of cathode current densities (semi-logarithmic scale) show a remarkable flat slope (Hull cell gradient). This suggests that the cyanoaurate(III) plating bath (5mM) tends to plate uniform deposits over irregularly shaped objects, due to reduced cathode current efficiency at higher current densities.

Figure 2 (semi-logarithmic scale) shows the cathode current density vs. the cathode efficiency for which the theoretical electrochemical equivalent of the three valent gold (2.450g Au/amp hr) is taken as 100 per cent.

Figure 3 illustrates schematically the appearance of ten Hull cell gold platings after ten minutes plating time as influenced by different additions of conducting salts. A still cyanoaurate (III) plating solution (1g Au/l) was used at 60C. The influence on the conductivity is shown by the resulting cell potentials in volts.

Platings on polished low carbon steel cathodes showed without pre-platings adherent bright gold deposits in the cathode current density range from 2 to 20 amperes per square foot (0.2 to 2 amp/cm² approximately). The low cathode current efficiency is advantageous for flash and decorative platings. The throwing power of the bath is excellent. The fine crystallinity of the deposit is assumably due to the chloride ions present. The tarnish resistance in hydrogen sulfide atmosphere of articles commercially plated with the described baths is said to be better than that of the same articles plated from conventional cyanoaurate(I) baths.

In order to obtain some evidence of the gold valency, a concentrated cyanoaurate(III) solution (62.2g Au/l) was electrolyzed. At a cathode current density of 33.5 amp/ft²

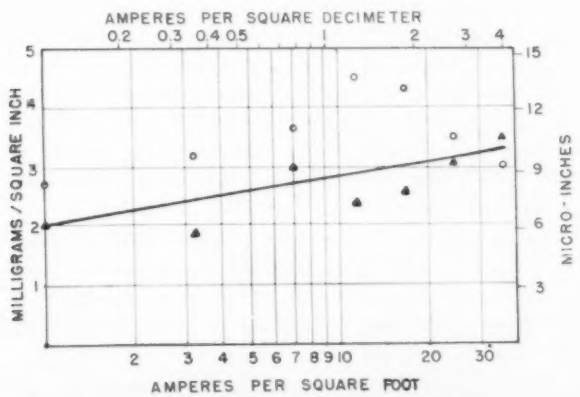
AMPERES PER SQUARE DECIMETER
0.2 0.3 0.4 0.5 1 2 3 4
MILLIGRAMS / SQUARE INCH
MICRO-INCHES
AMPERES PER SQUARE FOOT
2 3 4 5 6 7 8 9 10 20 30

Fig. 1. Cathode current density vs. weight and thickness of gold deposit. (Two Hull Cell tests: 1 min, 1 amp, 6 volts, 65C.)

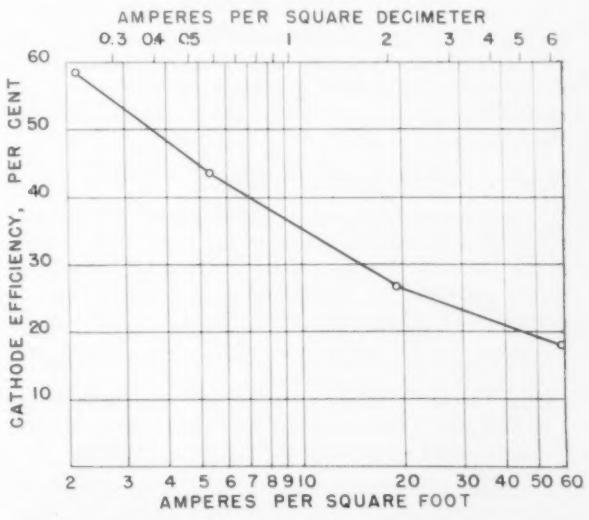
AMPERES PER SQUARE DECIMETER
0.3 0.4 0.5 1 2 3 4 5 6
CATHODE EFFICIENCY, PER CENT
AMPERES PER SQUARE FOOT
2 3 4 5 6 7 8 9 10 20 30 40 50 60

Fig. 2. Cathode current density vs. cathode efficiency (100 per cent = 2.450 g Au/amp hr) of $Au(CN)_4^-$ still plating bath (1g Au/l = 5mM, no wetting agent) at 70C.

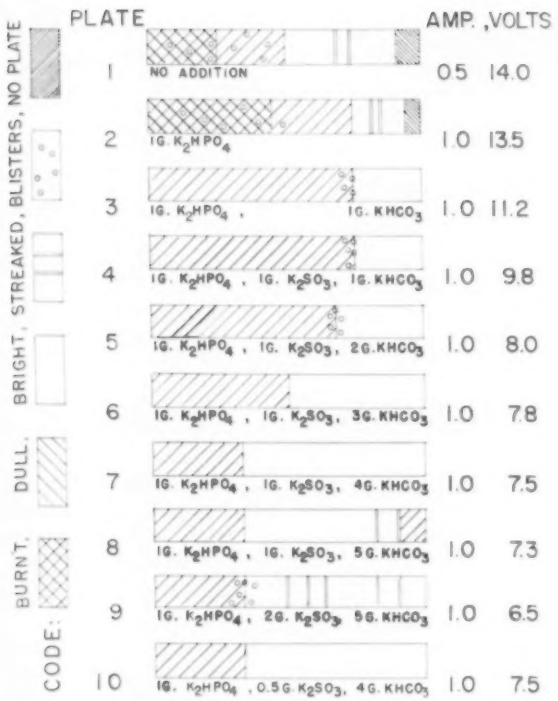
PLATE
AMP.
VOLTS
BRIGHT, STREAKED, BLISTERS, NO PLATE
DULL
BURNT
CODE:
1 NO ADDITION 0.5 14.0
2 1G. K_2HPO_4 1.0 13.5
3 1G. K_2HPO_4 , 1G. $KHCO_3$ 1.0 11.2
4 1G. K_2HPO_4 , 1G. K_2SO_3, 1G. $KHCO_3$ 1.0 9.8
5 1G. K_2HPO_4 , 1G. K_2SO_3, 2G. $KHCO_3$ 1.0 8.0
6 1G. K_2HPO_4 , 1G. K_2SO_3, 3G. $KHCO_3$ 1.0 7.8
7 1G. K_2HPO_4 , 1G. K_2SO_3, 4G. $KHCO_3$ 1.0 7.5
8 1G. K_2HPO_4 , 1G. K_2SO_3, 5G. $KHCO_3$ 1.0 7.3
9 1G. K_2HPO_4 , 2G. K_2SO_3, 5G. $KHCO_3$ 1.0 6.5
10 1G. K_2HPO_4 , 0.5G. K_2SO_3, 4G. $KHCO_3$ 1.0 7.5

Fig. 3. Influence of different additions of salts on Hull cell potential (volts) and surface appearance of steel cathode test plates. Still plating bath, $Au(CN)_4^-$ (5 mM), Cl^- (20 mM), 60C, 3 min plating time.

(28C, no addition salts added) the cathode efficiency was determined to be 100 per cent of the theoretical electrochemical equivalent of the three valent gold (2.450g Au/amp hr). For this plating, a platinum anode was used since the chloride ions present (94.16g/l) react vividly with stainless steel.

CONVERSION OF CYANOAURATE(III) INTO CYANOAURATE(I)

Wogrinz[4] described the preparation of alkali metal cyanoaurate(I), $MAu(CN)_2$, by adding cyanide solution to a chloroaurate(III) solution and dissolving gold foil in this solution by heating for several hours. He suggests the following equation:

$$MAuCl_4 + 6\,MCN + 2Au \rightarrow 3MAu(CN)_2 + 4MCl \qquad \text{Eq. 11}$$

Since cyanide is a stronger complexing agent than chloride, the reaction shown in equations 9 and 10 presumably occur as the first step. The second step would be the reduction of cyanoaurate(III) by metallic gold to cyanoaurate(I) as expressed in the following equation:

$$Au(CN)_4^- + 2\,Au + 2CN^- = 3Au(CN)_2^- \qquad \text{Eq. 12}$$

This reaction is a typical example of oxidation-reduction. Two gold atoms in the 0 state are oxidized to the +1 state, while a trivalent gold ion is reduced to the +1 state:

$$2Au = 2Au^+ + 2e^- \qquad \text{Eq. 13}$$

$$2e^- + Au^{+++} = Au^+ \qquad \text{Eq. 14}$$

$$2Au + Au^{+++} = 3Au^+ \qquad \text{Eq. 15}$$

Cyanoaurate(III) acts as the oxidizer and metallic gold as the reducer. The same reactions presumably will occur if metallic gold is used as an anode in cyanoaurate(III) solutions.

EQUIVALENT ELECTRICAL CONDUCTIVITIES

The equivalent conductivities of solutions of the sodium and potassium salts of the anions of cyanoaurate(III) and cyanoaurate(I) have been determined by A.Wogrinz and C. Stefas.[5] Their measurements were in the temperature range beween 10 and 30 degrees Centigrade. The results are shown in Table VI.

TABLE VI

EQUIVALENT CONDUCTIVITIES BY A. WOGRINZ AND C. STEFAS

Solution/Temperature	Centigrade		
	10	20	30
	$\times 10^{-6}$ ohm^{-1} cm^{-1}		
$NaAu(CN)_2$	36.92	45.84	55.39
$KAu(CN)_2$	35.50	44.38	53.17
$NaAu(CN)_4$	25.81	32.57	40.14
$KAu(CN)_4$	27.84	31.63	40.65

From Table VI it can be seen that within the given temperature range cyanoaurate(I) has a higher conductivity than cyanoaurate(III) in equivalent solutions. No great differences exist between the sodium and potassium salts having the same anions.

SOLUBILITY

Qualitative comparison of the solubility of the sodium and potassium cyanoaurate(III) salts shows that the latter is slightly more soluble in water. 53.70 grams of potassium cyanoaurate, $KAu(CN)_4$, (the equivalent of one troy ounce of gold, Cf. Table III), in one liter stay in solution at room temperature, but at lower temperature the salt will crystallize as colorless plates containing 1½ moles of water: $KAu(CN)_4 \cdot 1\frac{1}{2}H_2O$. The crystals may be dehydrated by heating to 200C, but if more strongly heated, cyanogen is evolved and potassium cyanoaurate(I) is obtained.[6]

Hydrochloric acid decomposes cyanoaurate(III) and has been reported[7] to give a mixture of yellow gold cyanide and metallic gold. The chemistry of this reduction seems to be complicated since simple acid-base and oxidation-reduction equations do not balance.

Investigations on the cyanoaurate(III) complex by the polarographic method are in progress and will be published later.

SUMMARY

1. The reacting amount of aqua regia for the dissolution of metallic gold has been computed; a method is described to avoid losses of gold and acids.
2. The neutralization of chloroauric(III) acid and the formation of gold hydroxide is explained in terms of hydrolysis.
3. The "yellow prussiate gold plating bath" is described.
4. The cyanoaurate(III) anion is suggested to be present in special types of gold plating baths. Its formation is explained and the amount of reactants and products are computed.
5. Optimum plating conditions and some properties of the gold deposited from the cyanoaurate(III) type of plating baths are described. Optimum concentrations of addition salts and wetting agents are given.
6. The conversion of cyanoaurate(III) into cyanoaurate(I) is explained in terms of an oxidation-reduction reaction.
7. The equivalent conductivities and the solubilities of sodium and potassium salts of cyanoaurate(III) are discussed.

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[7]Wogrinz, A., Preparation of Gold Cyanide, Metalloberflaeche **8,** no. 11, p. 162, (1954).

Dr. Anton F. Mohrnheim is associate professor of metallurgy, and director of the Metallurgical Research Laboratory of the Division of Engineering Research and Development of the University of Rhode Island.

He was born in Schwabach bei Nuernberg, Germany in 1913, graduated from high school in Pforzheim, Germany in 1933, studied chemistry at the College of Technology of Baden, Karlsruhe, Germany (1934–1936), arts and sciences at the Sorbonne, University of Paris, France (1936–1937), majored in physical chemistry in Karlsruhe, (1939), and worked for his dissertation at the Kaiser Wilhelm Institute (now Max Planck Institute) for Metallurgical Science, an affiliation of the College of Technology, Stuttgart, Germany, where he received his Doctorate of Engineering, (1942).

After World War II he emigrated to Canada, where he was appointed in 1952, Research Fellow and Assistant Project Director of the American Electroplaters' Society, Project No. 14, (The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on the Electroplating) at the Ontario Research Foundation in Toronto, Ontario. After his admission to the United States in 1954, he was three years with Leach & Garner Co., in Attleboro, Massachusetts, where he built up and headed their Metallurgical Laboratory. In 1957 he joined the University and in 1959 he became a naturalized American citizen.

He is a registered professional engineer of the Province of Ontario and of the State of Rhode Island, a member of the German Society for Metallurgical Science, AES, AIME, ASM and Sigma Xi. He has authored and coauthored several technical papers on electroplating, metallurgy and metal finishing.

THE POLAROGRAPHIC ANALYSES OF Cd^{+2}, Co^{+2}, Cu^{+2}, Zn^{+2}, Fe^{+3}, Sn^{+4}, Cr^{+6} IN AN ACID CYANIDE GOLD PLATING SOLUTION

by JAMES A. MILLER*

ABSTRACT

Polarographic procedures were developed for the determination of Cd, Co, Cu, Zn, Fe, Sn, and Cr in an acid gold plating solution. Nickel, if present, will interfere with the zinc determination.

INTRODUCTION

MANY METHODS have been published on polarographic determination of various ions in gold plating solutions, this paper however deals specifically with an acid cyanide solution.** The object of the investigation was to develop polarographic methods of analyses for the determination and ultimate control of contaminants which were thought to have a relationship to occasional poor plating characteristics.

All of the ions mentioned in the title of this paper are contaminants with the exception of cobalt.[1] Since all of these contaminants are at an extremely low level of concentration (ppm), classical wet methods of analyses were not satisfactory because of 1) lack of accuracy and 2) the time-consuming chemical separations that would have been involved. Polarography does lend itself very well to these analyses and is, in fact, probably one of the very few suitable instrumentation methods available. As this specific solution is used in the aircraft and missile industries, the interest in these polarographic developments should be widespread. Any experienced polarographer will be able to follow and to perform the procedures outlined.

ANALYSIS PROCEDURES

Chemical procedure: Because the organics present in this solution will interfere with these analyses, they must be removed. Also, for electro-reducible polarographic determinations, the ions in question usually must be in their higher valence state which behooves the use of an oxidizing agent compatible with organics—one that would not be an explosion hazard. Since this sample treatment will cause the formation of HCN, among other gases, the entire treatment must be conducted in a hood for safety purposes.

A 50 ml sample is added by pipet to a 500 ml Kjeldahl flask and to this is cautiously added, by graduate, 10 ml of conc. H_2SO_4 and 15 ml conc. HNO_3. These contents are digested on a ring-stand and Bunsen burner until evolution of SO_3, white fumes, and the precipitation of the gold. At this point the contents of the flask should be brown in color due to the presence of organics. HNO_3 is cautiously added, dropwise, every few minutes until all of the organics are driven off as CO_2, at which point the contents of the flask assume a purple or cobaltous color.

The sample is now partially diluted and then filtered through Whatman 41H. The gold precipitate is washed first with dilute HNO_3 and then water, ignited in a tared porcelain crucible and weighed. The filtrate is adjusted to near *p*H 7.0 with NH_4OH and brought to original 50 ml volume with distilled water. The *p*H is determined with Hydrion paper.

POLAROGRAPHIC PROCEDURES

All of the experimental data were obtained by using an Hg Pool anode in preference to the S.C.E. as the reference cell. The values of the half-wavepotentials in the various electrolytes are shown in Table I. All of the following methods are calculated according to the Standard Addition Method,[2] after establishment of linearity.

COPPER, CADMIUM, ZINC

Figs. 1 and 1a.

Supporting Electrolyte: 2M NH_4 OAc 2M HOAc E $\frac{1}{2}$ vs Mercury Pool Anode: Cu^{+2} at −0.07v, Cd^{+2} at −0.8v, Zn^{+2} at −1.1v.

1. Add by pipet 5 ml of treated sample to a Heyrovsky cell.
2. Add by pipet 10 ml of NH_4OAc − HOAc electrolyte.
3. If necessary, adjust to *p*H 7.0 as indicated by Hydrion paper.
4. Deaerate (for 5 min).
5. Blanket.
6. Scan from 0 to −1.2 volts.
7. Add 100 lambda each of Cu^{+2}, Zn^{+2}, and Cd^{+2} standards (about 1 g/l of respective ion).
8. Repeat steps 4 through 6.
9. Calculate the individual concentrations from the following equation.

* Boeing Airplane Company, Aero. Space Division, Seattle, Washington. Present address Chief Chemist, State of Alaska, Division of Highways, Fairbanks, Alaska.
** Trade name, Autronex "C," produced by Sel-Rex Corporation, Nutley, N. J.

TABLE I

E $\frac{1}{2}$ vs Hg POOL OF THE ABOVE IONS IN VARIOUS ELECTROLYTES

	2M NH_4OAc 2M HOAc	0.1M EDTA 2M Na OAc	4M NH_4Cl 1M HCl	1M NaOH	0.1M KCl (buffered pH 7.0)
Cu^{+2}	−0.07				
Cd^{+2}	−0.8				
Zn^{+2}	−1.1				
Co^{+2}					−1.4
Fe^{+3}		−0.1			
Sn^{+4}			−0.5		
Cr^{+6}				−0.5	

CALCULATION

$$Cu = \frac{i_u V_s C_s D.F.}{i_s V_s + (i_s - i_u) V_u}$$

Where C_u Concentration of unknown in g/l
V_s Volume of standard added in ml
Where C_s Concentration of standard in g/l
D.F. Dilution factor
i_u Waveheight of unknown
i_s Waveheight after addition
V_u Volume of unknown solution (Volume of electrolyte + sample) in ml.

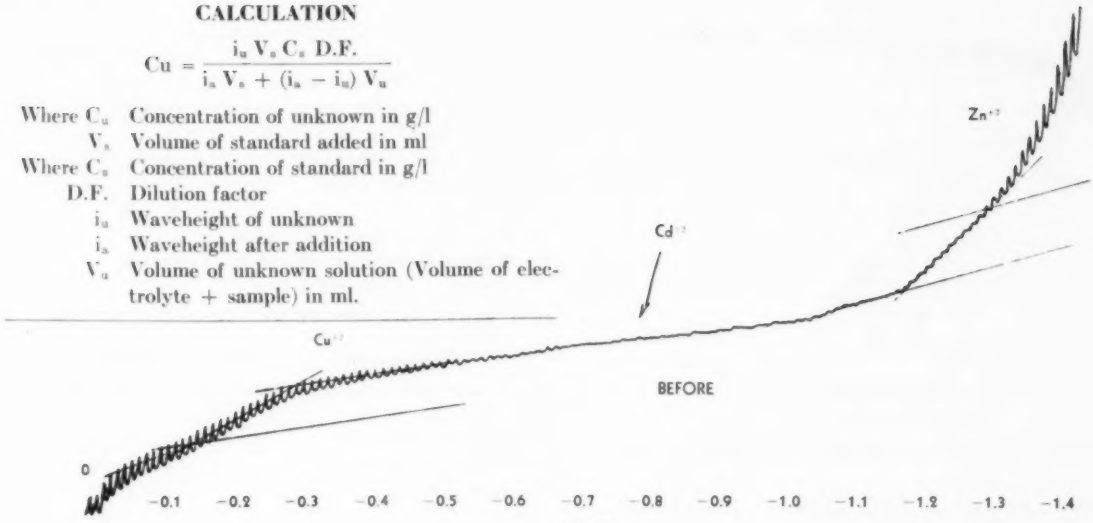

Fig. 1

IRON

Figs. 2 and 2a.

Supporting electrolyte: 2M NaOAc 0.1M EDTA E ½ vs Mercury Pool Anode Fe^{+3} at −0.1 volt.

1. Add by pipet 5 ml of treated sample to a Heyrovsky cell.
2. Add by pipet 10 ml of EDTA − NaOAc electrolyte to above.
3. If necessary, adjust to *p*H 7.0 using Hydrion paper.
4. Deaerate (for 5 min).
5. Blanket.
6. Scan from 0 to −0.3 volt.
7. Add 100 lambda Fe^{+3} Standard (1g/l Fe^{+3}).
8. Repeat steps 4 through 6.
9. Calculate the Fe^{+3} concentration from the above equation.

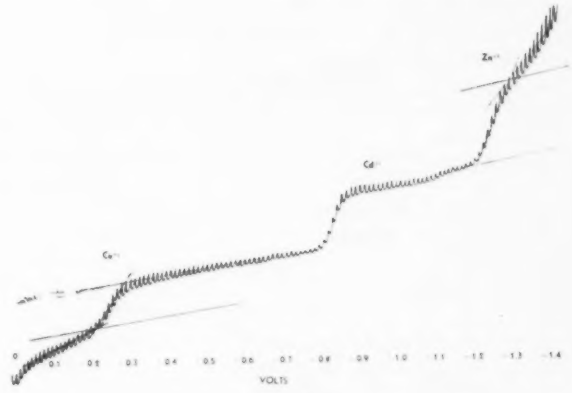

Fig. 1a

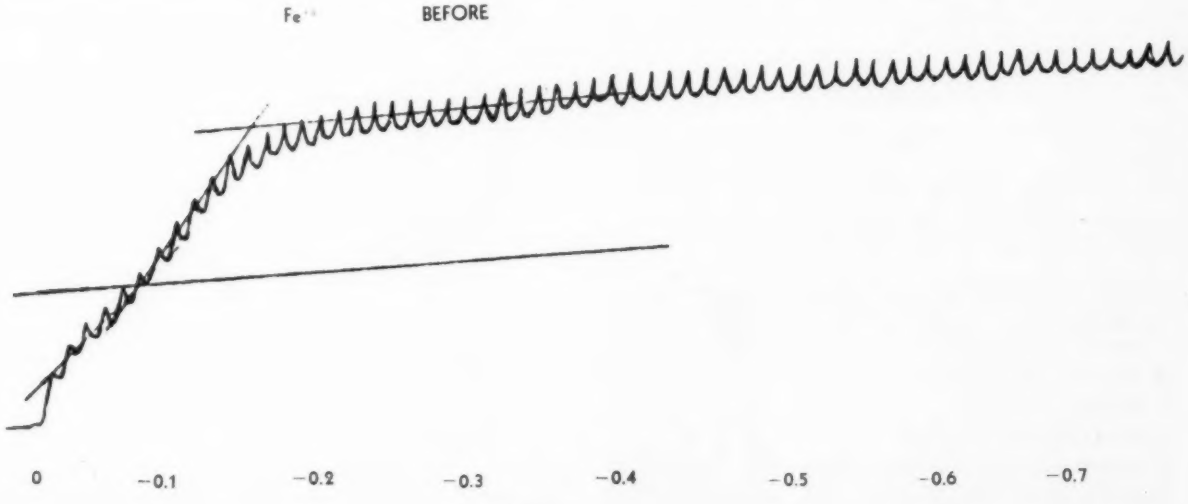

Fig. 2

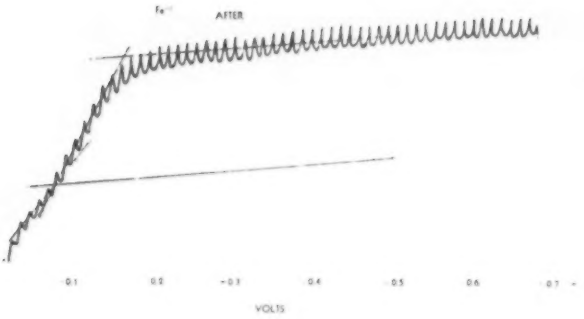

Fig. 2a

CHROMIUM

Figs. 3 and 3a.

Supporting Electrolyte 1 M NaOH E ½ vs Mercury Pool Anode Cr^{+6} at −0.5 volt.

1. Add by pipet 5 ml of treated sample to Heyrovsky cell.
2. Add by pipet 5 ml of NaOH electrolyte to the above.
3. Deaerate (for 5 min)
4. Blanket.
5. Scan from 0 to −0.7 volt.
6. Add 50 lambda Cr^{+6} Standard (lg/l Cr^{+6}).
7. Repeat steps 3 through 5.
8. Calculate the Cr^{+6} concentration from above equation.

COBALT

Figs. 5 and 5a.

Supporting Electrolyte 0.1 M KCL buffered to *p*H 7.0.
E ½ vs Mercury Pool Anode Co^{+2} at −1.4 volts.

1. Add by pipet, 10 mls of buffered electrolyte to a Heyrovsky cell.
2. Add 250 lambda of treated sample to the above.
3. Deaerate (for 5 min).
4. Blanket.
5. Scan from −1.0 to −1.8 volts.
6. Add 250 lambda Co^{+2} Standard (lg/l Co^{+2}).
7. Repeat steps 3 through 5.
8. Calculate Co^{+2} concentration from above equation.

COMMENTS AND CONCLUSIONS

In 2 molar solutions, the zinc and nickel waves merge at E ½ −1.2 volts vs Hg Pool. However, as there is no nickel present in this sample, by U. V. emission spectroanalysis, no problem is presented and simultaneous polarograms of Cu^{+2}, Cd^{+2}, Zn^{+2}, are obtained at well-separated potentials.

Any impurities which may be found in any of the reagents used in these analyses are compensated for by obtaining an electrolyte polarogram prior to running the actual analyses. This value, if any, is then subtracted from the waveheight of the ion in question.

As wet-chemistry did not lend itself to the analyses of this solution, polarography is probably one of the very few mediums for accurate analyses. However, although wet-chemical data were not available for comparative purposes,

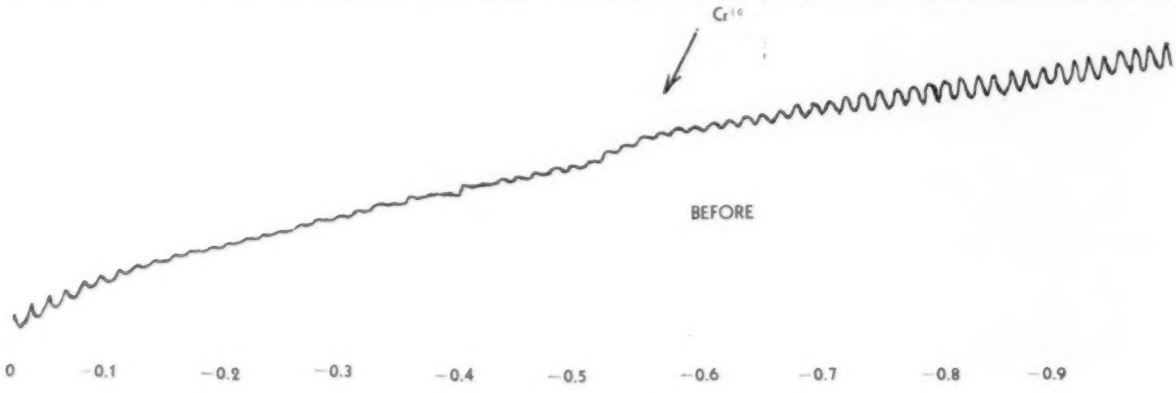

Fig. 3

TIN

Figs. 4 and 4a.

Supporting Electrolyte 4M NH_4 Cl 1 M HCL E ½ vs Mercury Pool Anode Sn^{+4} at −0.5 volt.

1. Add by pipet, 5 ml of treated sample to Heyrovsky cell.
2. Add by pipet, 5 ml HCl − NH_4 Cl electrolyte to the above.
3. Deaerate (for 5 min)
4. Blanket.
5. Scan from 0 to −0.7 volt.
6. Add 50 lambda Sn^{+4} Standard (lg/l Sn^{+4}).
7. Repeat steps 3 through 5.
8. Calculate the Sn^{+4} concentration from the above equation.

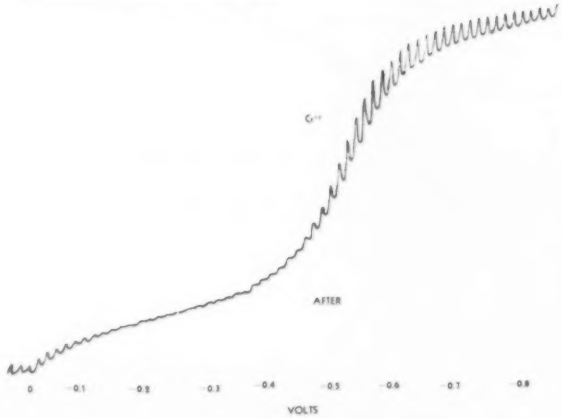

Fig. 3a

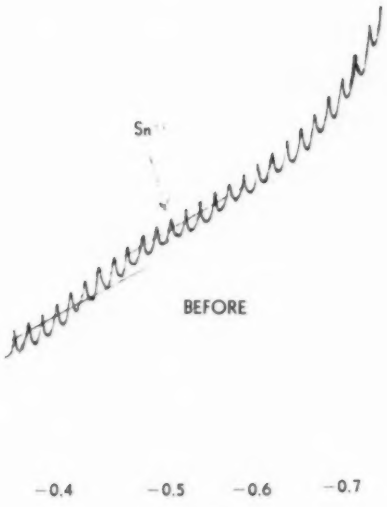

Fig. 4

these data agreed very well with X-ray and U.V. emission spectrographic data. Because of its heavy concentration, gold is being determined gravimetrically at this laboratory.

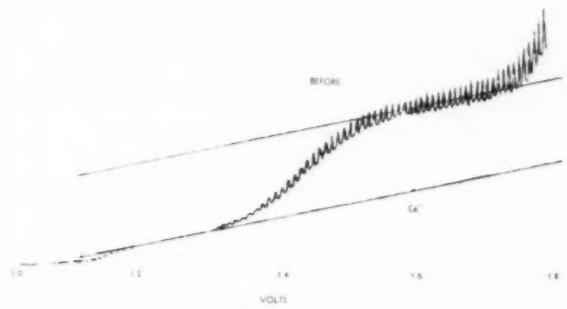

Fig. 5

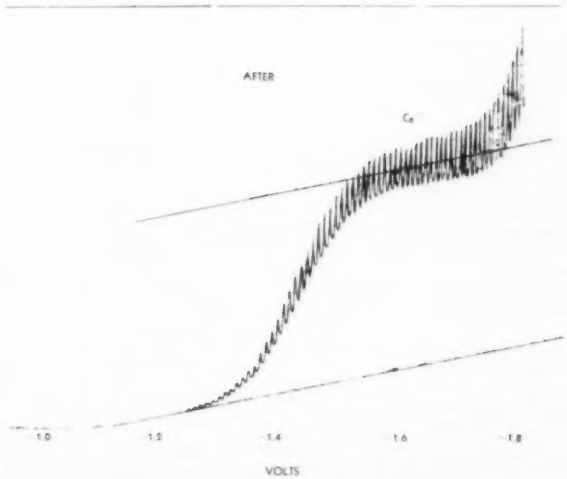

Fig. 5a

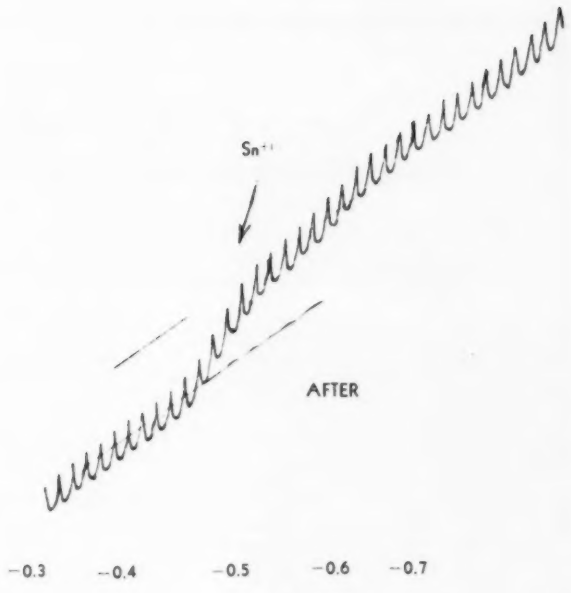

Fig. 4a

ACKNOWLEDGMENT

The author wishes to express sincere appreciation to Mrs. Theresa Reddington for her invaluable assistance. The author also wishes to thank Sel-Rex Corporation for permission granted.

This work was done in the Instrumentation Laboratory of Boeing Airplane Company and is published with permission of the management.

APPENDIX

All experimental data were obtained with a Leeds & Northrop Electro-Chemograph Type E. The electrolysis vessel is the Erlenmeyer-style Heyrovsky cell. Resistance of the cell has approximately 85 ohms with 0.1N KNO_3 as determined by a conductivity bridge. The capillary constant was 2.32 mg $^{2/3}$ $sec^{1/6}$ in 0.1N KNO_3 at −1.0 volt with a drop time of 3.69 mg/sec. All of these data were obtained with this capillary and constant.

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[1]Meites, Louis, "Polarographic Techniques," p. 259. Published by Interscience Publishers, New York, 1955.

[2]Meites, Louis, "Polarographic Techniques," pp. 178-179. Published by Interscience Publishers, New York, 1955.

James A. Miller was an associate research engineer with Boeing Airplane Company, Aero-Space Division, Seattle, Washington, and is now chief chemist for the State of Alaska, Division of Highways. He received an Associate of Arts degree at San Antonio College 1954 and a BS degree in chemistry at St. Mary's University, San Antonio, Texas in 1956. He has been active in research work in the fields of electrochemistry and flame photometry, and is a member of the Seattle Professional Engineering Employees Association and the American Chemical Society.

1961 — 1962
COMPOSITION AND LEADERSHIP

REGIONAL AND BRANCH STRUCTURE FOR PROMOTION OF AES BRANCH MEMBERSHIP, AMERICAN ELECTROPLATERS' SOCIETY, INC.

I AUSTRALIAN REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: Bruce Leslie, 32 Central Park Rd., E. Malvern, Victoria, Australia

1. ADELAIDE—D. McNamara, 71 Maxwell Tce., Dunleath Sth. Australia
2. MELBOURNE—William J. Regan, Automatic Plating Equipment, Ltd., 21 Argo St., South Yarra, Melbourne, Victoria, Australia
3. SYDNEY—W. H. Coulson, 52 Nicholson St., Chatswood,Sydney, N.S.W., Australia

♦

II DIXIE REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: George W. Taylor, Production Plating Company, Adel, Georgia

4. BLUE RIDGE—Carl A. Witherspoon, Box 286, Blacksburg, Virginia
5. MEMPHIS-MIDSOUTH—James R. Lee, 2690 Yale Avenue, Memphis, Tenn.
6. MIAMI—Marmaduke H. Dent, 4798 N.W. 5th Street, Miami, Florida
7. SOUTHEASTERN—Jerry H. LaChapelle, 3230 Peachtree St., N.E., Atlanta 5, Georgia

♦

III EASTERN CANADIAN REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: Gordon A. Lince, 126 Boxley Road, Burlington, Ontario, Canada

8. HAMILTON—J. G. Needham, Box 284, Waterdown, Ontario, Canada
9. MONTREAL—Harold T. Wilson, 8181 Royden Rd., Mount Royal, Quebec, Canada
10. TORONTO—(Notification Awaited)
11. WESTERN ONTARIO—R. A. Campbell, 296 Cecil Street, Sarnia, Ontario, Canada

♦

IV EMPIRE STATE REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: John J. Bunsic, 19 Duane Avenue, Binghamton, N. Y.

12. BUFFALO—Richard L. Davis, 12 Englewood Ave., Jamestown, N. Y.
13. CAPITOL DISTRICT—Arthur Eisner, 1021 Helen St., Schenectady, N. Y.
14. MOHAWK VALLEY—Merle Ihrie, 14 Pineview Terrace, Sidney, N. Y.
15. ROCHESTER—Loring F. Carson, 2705 Pinnacle Rd., Rush, N. Y.
16. SYRACUSE—(Notification Awaited)
17. SOUTHERN TIER—(Notification Awaited)

♦

V KEYSTONE STATE REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: James E. Cogan Jr., Globe Electroplating Co., 445 Fairmount Avenue, Philadelphia 23, Pa.

18. ALLENTOWN-READING—Homer Ressler, 1109 W. Union Blvd., Bethlehem, Pa.
19. LANCASTER—Martin S. Frant, AMP Inc., Research Div., Harrisburg, Pa.
20. PHILADELPHIA—Joseph W. Berenato Jr., 44 E. Allen St., Philadelphia 23, Pa.
21. PITTSBURGH—Edward B. Keller, 1102 Sunday St., Pittsburgh 12, Pa.

♦

VI METROPOLITAN REGIONAL MEMBERSHIP PROMOTION GROUP

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22. NEW YORK—Arthur Carlson, Engineering Service Div., General Chemical Corp., Edgewater, N. J.
23. NEWARK—John Kosmos, 140 Liberty Street, Hackensack, New Jersey
24. BALTIMORE-WASHINGTON—Edward J. Roach, 1601 Woodburne Avenue, Baltimore 12, Maryland

♦

VII MIDWEST REGIONAL MEMBERSHIP PROMOTION GROUP

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25. CHICAGO—Joseph C. Corre, Amphenol Borg Corp., 2801 S. 25th Avenue, Broadview, Illinois
26. CENTRAL IOWA—(Notification Awaited)
27. MILWAUKEE—Clinton Host, 4459 N. 83rd Street, Milwaukee 18, Wisc.
28. MISSISSIPPI VALLEY—Jacob Knanishu, 2533 21st St., Rock Island, Ill.
29. ROCKFORD—Charles L. Miner, 2020 Edgebrook Dr., Rockford, Ill.
30. ST. JOSEPH VALLEY—George Shuman, 17616 Hepler Street, South Bend, Ind.
31. ST. LOUIS—Peter K. Young, 5008 Idaho Ave., St. Louis 11, Mo.

♦

VIII NEW ENGLAND REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: William C. Geisker, 41 Nancy St., Watertown, Conn.

32. BOSTON—(Notification Awaited)
33. BRIDGEPORT—Emil Bergen, 129 Greenfield Drive, Trumbull Connecticut
34. HARTFORD—Edwin Crandall, Old Turnpike Rd., Plantsville, Conn.
35. NEW HAVEN—Vincent J. Capuano, 25 Whitney Ct., Hamden 10, Conn.
36. PROVIDENCE-ATTLEBORO—C. L. Capobianco, 639 Fruit Hill Avenue, N. Providence 11, R. I.
37. SPRINGFIELD—Ernest P. Donaruma, 75 Sprague St., W. Springfield, Mass.
38. WATERBURY—Patrick R. Mazzamaro, 26 Hazel Street, Oakville, Conn.

♦

IX SOUTHWESTERN REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: Myron E. Browning, 3557 Wedgway, Fort Worth, Texas

39. DENVER—James H. Jenkins, Shwayder Brothers, Inc., 1050 So. Broadway, Denver, Colorado
40. DALLAS-FORT WORTH—Donald L. Allie, 4101 Burton Ave., Fort Worth 5, Texas
41. HOUSTON—Dale Chapman, 6630-1 Sylvan Rd., Houston, Texas
42. KANSAS CITY—Robert L. Garrett, 3828 E. 9th Terrace, Kansas City 27, Missouri
43. PHOENIX—John Mularkey, 5020 E. Yale, Phoenix, Arizona
44. WICHITA—Max E. Brinnon, 1142 Charlotta, Wichita, Kansas

♦

X TRI-STATE REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: Richard O. Watson, 4500 Cherry Lane, Indianapolis, Indiana

45. CLEVELAND—Gordon H. Carlson, 326 Pasadena Avenue, Elyria, Ohio
46. COLUMBUS—John Coffey, Box 328-P, Powell, Ohio

(Continued on next page)

AES NEWS

NINTH INTERIM MEETING

SUPREME SOCIETY
AMERICAN ELECTROPLATERS' SOCIETY, INC.
MAROTT HOTEL
INDIANAPOLIS, INDIANA
JANUARY 11–14, 1962

TENTATIVE PROGRAM

THURSDAY, JANUARY 11
8:00 p.m.—AES Executive Board Meeting

FRIDAY, JANUARY 12
9:00 a.m.—AES Executive Board Meeting
9:30 a.m.—AES Constitution & Bylaws Amendment Committee (All Day)
2:00 p.m.—AES Educational Committee
2:00 p.m.—AES Membership Committee
8:00 p.m.—Special Meeting, Indianapolis Branch (All AES members welcome)

SATURDAY, JANUARY 13
9:00 a.m.—Registration of Delegates
10:00 a.m.—Interim Meeting, Supreme Society
1:00 p.m.—Dutch Treat Luncheon
2:00 p.m.—Interim Meeting, Supreme Society
8:00 p.m.—Joint Meeting, Executive Board and AES Constitution and Bylaws Revision Committee

SUNDAY, JANUARY 14
9:00 a.m.—Executive Board Meeting (To Adjournment)

AGGRESSIVE BRANCH MEMBERSHIP EXPANSION DRIVE LAUNCHED AND GAINING MOMENTUM

With every AES chartered Branch's "maximum effort" confidently expected, an aggressive Societywide campaign is now in progress targetted to swell each Branch's membership in good standing substantially beyond each Branch's membership stature as at July 1, 1961. Aside from focus upon electing the largest number of qualified new members possible, the drive is intended to inspire active Branch effort to minimize, to the limit, any attrition due to resignations or suspensions.

Pursuant to AES Bylaws, the leadership of Branch membership enlargement at Branch level is vested in each Branch's First Vice President, and these responsible Branch Officers are listed in the Manning Table for the 1961–1962 Branch Membership Expansion Campaign that appears on the page facing this.

For purposes of the dynamic 1961–1962 drive and its special goal of gaining maximum Branch membership expansion by mid-December 1961, each of AES's 61 chartered Branches (and its one currently Temporarily Chartered Branch) has been geographically classified by campaign region or area.

IRVIN M. WEISS
Chairman
AES Membership Committee

So as to coordinate and assist the First Vice Presidents of Branches within these campaign districts, a member or consultant of the 1961–1962 National Membership Committee has been assigned to each as Regional Chairman. Just as Branch First Vice Presidents are the Society's Branch Sales Managers, the Regional Chairmen are the Regional Sales Managers. Leading the entire campaign at national level is Irvin M. Weiss of the Detroit Branch who is 1961–1962 Chairman of the Society's National Membership Committee.

National Headquarters is prepared to assist any AES Branch in that Branch's membership expansion drive by providing reasonable quantities, upon the Branch's direct request, of any of the following well-considered AES membership promotional visual aids, 1) the effective Branch membership promotion two-color gatefold leaflet, including an Application Blank, 2) the more general booklet, "AES Membership: Its Meaning to You," also including an Application Blank and 3) the internationally lauded documentary booklet, "Milestones of AES," recommended by the Public Relations Committee.

1961-1962 AES REGIONAL MEMBERSHIP LEADERS

(Continued from previous page)

47. CINCINNATI—Charles Dumont, 5535 Leumas Avenue, Cincinnati 39, Ohio
48. INDIANAPOLIS—Mark M. Trook, 53 Willow Road, Anderson, Indiana
49. DAYTON—Walter W. Anderson, 1125 Willowdale, Dayton 29, Ohio
50. LOUISVILLE—Harlan Bowsher, Sherry Lane, Rt. 1, Box 49, Fern Creek, Kentucky

♦

XI WEST COAST REGIONAL MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: L. Truman Stoner, 12427 Sproul Street, Norwalk, California

51. BRITISH COLUMBIA—John R. K. Stoneberg, 3767 Manor Street, No. Burnaby, British Columbia
52. LOS ANGELES—Harvey K. Hunt, 719 W. Beverly Drive, Whittier, Calif.
53. PORTLAND—(Notification Awaited)
54. SAN DIEGO—George Loch, 1615 Fern Street, San Diego 2, California
55. SAN FRANCISCO—Donald Huff, 625 Market St., San Francisco, Calif.
*56. SANTA CLARA (TC)—Elston A. Flores, 873 Pippin Ave., Sunnyvale, California
57. SEATTLE-PUGET SOUND—David G. Kelly, 10710 N.E. 190th, Bothell, Washington

♦

XII WOLVERINE STATE MEMBERSHIP PROMOTION GROUP

REGIONAL CHAIRMAN: Irvin M. Weiss, Metal & Thermit Corp., 1700 E. 9 Mile Road, Detroit, Michigan

58. CENTRAL MICHIGAN—R. E. Tobin, 35835 Pine Tree, Livonia, Michigan
59. DETROIT—John F. Siefen, Siefen Compounds, Inc., 14325 Wisconsin Ave., Detroit 38, Michigan
60. GRAND RAPIDS—Bernard Kumko, 854 Bridge St., N.W., Grand Rapids 4, Michigan
61. SAGINAW VALLEY—George L. Gutscher, 2512 Walter St., Flint 4, Mich.
62. TOLEDO—Julius C. Bach, 1143 Berdan Avenue, Toledo 13, Ohio

*Temporary Charter Effective July 1, 1961.

INCO'S LA QUE TO ADDRESS DETROIT BRANCH 50TH ANNIVERSARY EDUCATIONAL SESSION

As a major 1961–1962 event observing its own FIFTIETH ANNIVERSARY, the Detroit Branch of AES will conduct its Annual Educational Session and its Annual Banquet at the Statler Hotel of that municipality Friday evening, December 1, and Saturday evening, December 2, respectively.

The Friday evening educational session will feature the talk on "What We Know and Do Not Know About Corrosion" by Frank L. LaQue, Vice President of International Nickel Co., Inc. and Manager of that company's Development and Research Division. Technical Chairman will be Chester G. Borlet, National President of the Society. Each of AES's five other National Officers will also be present to honor the Branch on its Golden Anniversary.

The AES Executive Board will meet in all-day special session Saturday. That evening, the Branch will climax its anniversary observance with a gala Golden Anniversary Banquet, including a floor show and dancing. A cocktail party sponsored by member companies of the Metal Finishing Suppliers' Association will precede the event. A handsome Detroit Branch Anniversary Handbook has been published and is another tribute to the Branch's anniversary planning.

Norman A. Smith of Electro Finishing Industries, Inc. is chairman for the December party.

AWARD FOR BEST BRANCH EXPANSION RECORD

AES Branches are grouped into three Divisions according to stature. Division A includes Branches with over 126 Active members; Division B (70-125 members; Division C (under 70 members).

That Branch making the best membership expansion record in its Division during the 1961-1962 competition year (June 1, 1961-May 31, 1962) will receive a $50 Award at the Milwaukee Annual Meeting of the Supreme Society in June 1962.

AES RESEARCH PROGRAM IN CAMPAIGN TO INCREASE SUSTAINING MEMBERSHIPS

AES's vital Research Program embodying seven Projects in 1961–1962 and recognized internationally for its values in expanding knowledge of the arts and sciences of plating and metal finishing, is sustained financially by AES not only by a share of each Active Member's annual Per Capita Tax and of each Member-at-Large's annual dues but also, and mainly, by the annual dues of each Sustaining Member company. At fiscal year-end June 30, 1961, AES had some 333 such Sustaining Memberships.

So as to increase the number of AES's Sustaining Members sizably so as to assist financially in expansion of AES Research, an intensive Sustaining Membership Expansion Campaign is now in progress under the AES Research Committee generally and its Vice Chairman for Finance Edward J. Kubis (Wyandotte Chemicals Corporation) of the Detroit Branch specifically.

The muscles and sinews of the campaign are AES's 61 Branches, with the generalship of respective Branch campaigns vested in the Branch Research Finance Chairmen appointed by those Branches. The list, as at press time, is spread below. Mission is to inspire as many industrial companies located in Branch communities having a dollars and cents interest in advancements in electroplating, metal finishing, organic coating and allied arts to apply for Sustaining Membership. Cost is $100 per membership.

To coordinate and assist Branch Research Finance Chairmen, the Research Committee has now appointed Regional Research Finance Chairmen under Mr. Kubis, and these, at press time, include:

Australia Research Region
Bruce Leslie, Melbourne Branch

Canada Research Region
Herbert A. Skelton, Toronto Branch

Dixie Research Region
George W. Taylor, Southeastern Branch

Empire State Research Region
Frank O. Beuckman, Rochester Branch (Pro Tem)

Edward J. Kubis
Vice Chairman for Finance
AES Research Committee

Keystone State Research Region
(To be appointed)

Metropolitan Research Region
Robert Duva, Newark Branch

Midwestern Research Region
George E. Parisho, Mississippi Valley Branch

New England Research Region
Raymond L. Mitchell, Waterbury Branch

Southwestern Research Region
Myron E. Browning, Dallas-Fort Worth Branch

Tri-State Research Region
(To be appointed)

West Coast Research Region
Lawrence M. Henderson, San Francisco Branch

Wolverine State Research Region
Edward J. Kubis, Detroit Branch

Each AES Branch is urged by the AES Research Committee to cooperate aggressively in this important 1961–1962 campaign. If a Branch Research Finance Chairman has not yet been appointed, each is urged to appoint a "go-getter" and to notify the National Executive Secretary of the appointment.

BRANCH RESEARCH FINANCE CHAIRMEN 1961-1962

ALLENTOWN-READING:
Carl Swartz

BLUE RIDGE:
Bruce E. Wallace

BRITISH COLUMBIA:
J. G. Smith

BUFFALO:
Daniel Stackowiak

CENTRAL MICHIGAN:
Don Martin

CINCINNATI:
Robert L. Winston

CLEVELAND:
Gordon H. Carlson

DALLAS-FT. WORTH:
Dr. Thomas C. Franklin

DAYTON:
Robert D. Fisher

DETROIT:
James D. Thomas

GRAND RAPIDS:
Steve Cowdery

HAMILTON:
E. K. Cranfield

HARTFORD:
Ralph H. McCahan

KANSAS CITY:
Richard E. Loupee

LOS ANGELES:
Wilbert G. Lidtke

MEMPHIS-MIDSOUTH:
John H. O'Neal

MISSISSIPPI VALLEY:
John Mohr

MOHAWK VALLEY:
Robert A. Stewart

NEWARK:
Robert Duva

NEW HAVEN:
William K. Murray

NEW YORK:
Arthur Carlson

PROVIDENCE-ATTLEBORO:
Dr. Edward A. Parker

ROCHESTER:
Frank O. Beuckman

ROCKFORD:
Charles L. Miner

ST. JOSEPH VALLEY:
Louis Rague

ST. LOUIS:
Gerard S. Clooney

SANTA CLARA (TC):
E. R. Dodge

SOUTHEASTERN:
Clem H. Hohner

TOLEDO:
Merlin Parker

WATERBURY:
Raymond L. Mitchell

AVAILABLE TO BRANCHES FROM NATIONAL HEADQUARTERS

	Price Each
MEMBERS INSIGNIA	
Sterling silver Branch Past Presidents buttons (Including Tax)	$1.38
Sterling silver AES Members buttons (Including Tax)	$1.43
ENGRAVINGS OF AES COAT OF ARMS	
Three-eighth Inch	$2.50
Five-eighth Inch	$3.50
Seven-eighth Inch	$4.00
(The coat of arms is pictured above)	
MEMBERSHIP PROMOTION LITERATURE	
Gatefold (two-color) including Application Blank (Reasonable Quantity)	Free
"AES MEMBERSHIP: ITS MEANING TO YOU" including Application Blank (Reasonable Quantity)	Free
Application Blanks (Two-side, single page)	Free
INSTITUTIONAL LITERATURE	
"Milestones of AES" (including illustrated chart, "Kaleidoscope of AES's First-Half Century")	Free
1960-1961 Annual Report (Booklet)	Free
RESEARCH PROGRAM	
"Is Advancement in Electroplating and Metal Finishing Important to Your Company's Future" (Booklet) Reasonable Quantity	Free
Research Program Serial Reports (See AES Book Section)	As Quoted
PLATING MAGAZINE	
Subscription Leaflet	Free
"For YOU the Advertiser" (Market Data and Media File)—Single copies only	Free
"Publishing Specifications for PLATING MAGAZINE Authors" (Booklet)	Free
PLATING MAGAZINE Binders (See AES Book Section)	As Quoted
BRANCH SUPPLIES	
Administrative Forms etc. of respective types relative to or necessary for Bylaw compliance and/or National Headquarters records and coordination	Free
"Certificate of Twenty-Five Year Membership" In quantity as quoted. Unit	28¢
TECHNICAL AND EDUCATIONAL	
Technical books (See AES Book Section)	As Quoted
"Introduction to Electroplating" (booklet) (See AES Book Section) Quantities as quoted. Unit Foreign, 45¢ . Domestic	35¢

PUBLIC RELATIONS COMMITTEE RECOGNIZES 1960-1961'S OUTSTANDING BRANCH PUBLIC RELATIONS DEEDS

At its meeting held in Boston, Massachusetts, June 20, 1961, the AES Public Relations Committee, with then-Chairman Arthur G. Pierdon presiding, noted the following as among the fiscal year's most outstanding individual Branch public relations deeds as reported and published in PLATING MAGAZINE's issues:

WATERBURY BRANCH

The Branch awarded a plaque for excellence in scientific achievement at the Science Fair held at Swift Junior High School in Watertown, Conn., March 16, 1961. In addition, a Branch member delivered a lecture and demonstration there on the subject of "Electroplating."

MILWAUKEE BRANCH

The Branch created an exhibit dramatically demonstrating electroplating and metal finishing in its respective phases. The exhibit was shown prominently in the Milwaukee Public Museum. It was viewed there by sizable audiences. The display was later transferred to the Metals Laboratory Building of the Milwaukee School of Engineering where it became a popular attraction.

NEW ENGLAND REGION

The Region's "Old Timers Night" at the AES's Eighth Interim Meeting, Hartford, February 11, 1961. Each Branch's selected representative "Old Timer" was recognized and awarded an inscribed plate.

OTHER

Dallas-Fort Worth Branch's outstanding two-day "Aerospace Symposium"; Phoenix Branch's lauded "Second Annual Metal Finishing Symposium"; Sydney Branch's "Series of Special Research Lectures"; Rochester Branch's own "Golden Jubilee Observance" and, of course, Toronto Branch's impressive "Symposium on Metal Finishing" that, as a full-day, midweek educational meeting, drew and held an AES audience of over 200.

Among other important business transacted, the Committee enacted a resolution recommending to the Executive Board that it initiate an AES Bylaw Amendment adding the Branch office of "Branch Public Relations Chairman" to the mandatory list of elective Branch officers.

FUTURE MEETINGS

Education is the business of AES. For National, Regional and Branch educational and other AES meetings ahead, see PLATING's section titled FUTURE MEETINGS herein.

AES THANKS . . .

AES and its Research Committee extend their hearty appreciation to Member-at-Large Werner Fluehmann of Zurich, Switzerland, for his $500 contribution to the AES Research Program. His spontaneous and welcome donation will help bear the cost of AES's significant seven-Project 1961-1962 Research Program.

NEWARK BRANCH READIES ANNUAL CHRISTMAS PARTY

On Friday and Saturday evenings, December 15 and 16, the Newark Branch will hold its Annual Technical Session and Banquet. Newark's banquet has become more popularly known as its Christmas Party. Both affairs will take place at the Robert Treat Hotel in Newark.

Two speakers are announced for the Friday technical meeting. Myron B. Diggin, vice president and technical director of Hanson-Van Winkle-Munning Company, Matawan, N. J., is scheduled to deliver a paper titled "Sulfamate Nickel Plating for Functional Uses." The second speaker will be John Miglin, president of Chem-Met Corporation, Paterson, N. J.

A Cocktail Party, with the MFSA as host, will be held at 5:30 p.m. on Saturday, followed at seven o'clock by the Banquet. Entertainment and dancing will add to the gaiety of the evening.

AES LAW AS OF JUNE 22, 1961

The Constitution and Bylaws of American Electroplaters' Society, Inc. (AES) was amended in several respects (See August 1961 PLATING MAGAZINE, Page 901) at the Annual Meeting of the Supreme Society, June 22, 1961. A complete, up-to-date consequent copy of AES law as at June 22, 1961 is spread on Pages 1120–1129 herein for the information and reference use of AES members.

You will need it for comparison with any reconstructed AES Constitution and Bylaws that may be offered in early 1962, for Supreme Society consideration and action, by the "Constitution and Bylaws Revision Committee" now activated and now at work on that assignment (PLATING, September 1961 issue, Pages 1017 and 1019) by order of the Supreme Society, summit governing council of AES.

REMINDERS TO AES CHARTERED BRANCHES

The list of your Branch's duly elected Branch Delegates and Alternate Delegates for 1961-1962 is due in the hands of the National Executive Secretary by or before *November 6, 1961* for accreditation. (Reference: AES Bylaws, Part II, Article VII, Section 1). Your list should be filed on the official form that has been provided to you by National Headquarters, and must be signed by both the Branch President and Branch Secretary.

♦

Your Branch, via its accredited Delegates, has been invited to nominate any qualified member of the Society whom it chooses for consideration for the AES Scientific Achievement Award for 1961-1962. Your choice must be supported by *seven* copies of a statement of your nominee's qualifications. These are all due in the hands of the National Executive Secretary by not later than *October 15, 1961* by the Award's regulations. No nominations will be accepted after that date.

♦

Your Branch, via its accredited Delegates, has been invited to nominate any qualified member of the Society whom it chooses for consideration for AES Honorary Membership. Your choice must be supported by six copies of a statement of qualifications. These are all due in the hands of the National Executive Secretary by not later than *November 15, 1961* by the recorded rules of the Supreme Society. No nominations will be accepted after that date.

♦

Your Branch, through its President of record, will be invited to nominate any member of the Society whom it chooses for consideration for the Charles Henry Proctor Memorial Leadership Award for 1961-1962. More information soon.

♦

If your Branch is among those very few Branches that have delayed to now in appointing a Branch Research Finance Chairman to spearhead your Branch's effort to stimulate Sustaining Membership applications by industrial companies in your area, with the help of the Regional Research Finance Chairman for your territory, please do so promptly and submit his name to the National Executive Secretary's office at earliest possible time for processing.

SYMPOSIUM AND WORKSHOP PANELS AT MIDWEST REGIONAL COUNCIL SEMINAR

by ALEXANDER ALEXANDER

The Midwest Regional Council of the American Electroplaters' Society will sponsor its Third Annual Technical Seminar at Argonne National Laboratories, Chicago, Illinois on Saturday, October 28.

Included in the program of events are four Workshop Panels on topics of vital interest to electroplaters. There will be two panels held at 9:55 a.m. "Organic Finishing," moderated by T. O. McCullough, National Lock Co., has as panel members Joseph M. Andrus, Croname, Inc.; Peter Iwema, Du Pont Finishes Division; James F. Wright, Wright Metal Processors; and Frank Foreman, Barber-Colmen Company. The topic of the other morning panel moderated by Simon P. Gary of Scientific Control Laboratories will be "Pickling and Bright Dipping." Scheduled panel members include Jack Eley, E. I. Du Pont de Nemours; William P. Innes, MacDermid, Inc.; John Jumer, Alchemize Corp.; Kenneth Westerberg, Mechanical Plating Co.; and Robert Schub, London Chemical Co., Inc.

Two panels will be conducted at 2:00 o'clock. "Cleaning" is the topic which will be discussed by Dr. Edward B. Saubestre, Enthone, Inc.; Bert Lewis, Northwest Chemical Co.; Robert Bender, Oakite Products, Inc.; Raymond Goodsell, Ardco; and Clarence Kolzow, Western Electric Co. Dr. Russel E. Harr will act as moderator for the panel. The topic of the second afternoon panel will be "Barrel Plating" and panel members include Joseph Corre, Amphenol-Borg Electronics Co.; Dr. Russel E. Harr, Western Electric Co.; William Geissman, National Lock Company; and Herman Tessmann, Allen Bradley Co. E. P. McCoy, Electrochemical Products Co., is moderator.

Four field trips are being planned for the day, while those who wish to attend the Symposium, "Plating on Uncommon Basic Metals," will hear Dr. Jay H. Monaweck of Argonne present his subject "Electroplating on Uranium"; Dr. George Dubpernell, Metal & Thermit Corporation, speaking on "Electroplating on Chromium Alloys"; Dr. D. Gardner Foulke, who is with Sel-Rex Corp., telling about "Plating on Precious Metals" and James Gore of Los Alamos Laboratory giving his talk entitled "Electroplating on Uranium." Also scheduled for the symposium are Christopher Marzano of Amphenol-Borg Electronics Co. presenting "Plating on Tungsten"; William B. Harding of Bendix Corp. whose topic is "Plating on Titanium"; Dr. George Wertwijn, Hoffman Electronics Co., giving a paper entitled "Plating Various Metals on Silicon" and Christopher Marzano scheduled to give a second talk on "Deposition of Uranium From Molten Salts." R. Scott Modjeska, educational chairman for the seminar.

Clyde Kelly and Dr. Jay H. Monaweck are general co-chairmen; registration chairman, Paul Glab; and publicity chairmen are Harold Ellis and Alexander Alexander.

1961-1962 AES LIAISON REPRESENTATIVES

1. American Society for Testing Materials
   JOHN P. NICHOLS, American Electroplaters' Society, Inc.
2. ASTM Committee, A-5
   AUGUST MENDIZZA, Bell Telephone Labs Inc.
3. ASTM Committee, B-8
   DONALD M. BIGGE, Chrysler Corp.
4. ASTM Committee, D-19
   HENRY A. KAFARSKI, Chemical Processing Co.
5. American Standards Assoc. Committee, Z-74
   GEORGE SCHORE, George Schore Associates
6. ASA Committee, Z-9
   W. B. FIDELIUS, Hanson-Van Winkle-Munning Co.
7. The Electrochemical Society
   DR. D. G. FOULKE, Sel-Rex Corp.
8. International Council on Electrodeposition and Metal Finishing
   WALTER L. PINNER, Chairman, The McGean Chemical Co.
   MYRON B. DIGGIN, Hanson-Van Winkle-Munning Co.
   DR. WALTER R. MEYER, Enthone Inc.
   DR. RICHARD B. SALTONSTALL, The Udylite Corp.
9. National Association of Corrosion Engineers
   C. O. DURBIN, Chrysler Corp.
10. Metal Finishing Suppliers' Association
    EDWARD E. OBERLAND, Western Electric Co.
11. National Association of Metal Finishers
    ARTHUR G. PIERDON, Art Metal Finishing Co.
12. National Technical Task Committee on Industrial Wastes
    DR. D. GARDNER FOULKE, Sel-Rex Corp.
13. Ohio River Valley Sanitation Commission
    WILLIAM J. NEILL, Columbus Metal Products, Inc.
14. Society of Aerospace Materials and Process Engineers (SAMPE)
    MYRON E. BROWNING, General Dynamics/Fort Worth
15. Society of Plastic Engineers (SPE)
    FREMONT L. SCOTT, Metal & Thermit Corp.

FORTY-NINTH ANNUAL CONVENTION
AMERICAN ELECTROPLATERS' SOCIETY, INC.

SPONSOR: American Electroplaters' Society, Inc. (AES), American Building, 443-445 Broad Street, Newark 2, New Jersey, and its 61 chartered American, Canadian and Australian Branches.

HOST: The Midwest Regional Council of AES, including its Chicago, Milwaukee, Mississippi Valley, Rockford, St. Joseph Valley and St. Louis Branches.

SITE AND HOTEL: Schroeder Hotel, Milwaukee, Wisconsin.

DATES: June 24-28, 1962, in AES's fifty-third year.

ADULT REGISTRATION: For male and female adults—$25 per person including Banquet, Outing, and all other AES official Convention events.

CHILDREN REGISTRATION: For registered children—$15 per child, not including Banquet, but including three days of supervised sightseeing and children's program events, plus the Outing.

HOTEL ACCOMMODATIONS: Order direct via Hotel Reservation Form to come to AES members in January 1962 from the Convention Committee via AES National Headquarters.

CONVENTION GENERAL CHAIRMAN: Herman A. Tessmann (Milwaukee Branch), 3864 South 57th Street, Milwaukee, Wisconsin.

LADIES CHAIRMAN: Mrs. Charles Auchter, 920 East Wye Lane, Milwaukee 17, Wisconsin.

GRAND OPENING SESSION • EDUCATIONAL PROGRAM • AES BOARD AND COMMITTEE MEETINGS • LADIES PROGRAM • CHILDREN'S PROGRAM • PLANT TOURS • DANCES • SIGHTSEEING • OUTINGS • UNIQUE CONCERT • SPONSORED RELAXATIONAL PROGRAMS • COCKTAIL PARTIES • GET-TOGETHER • GOLF TOURNAMENT • BANQUET • ENTERTAINMENT • FLOOR SHOW • ANNUAL BLUM LECTURE

Hotel Schroeder, 1962 AES Convention Headquarters

MILWAUKEE AND YOU!

WEATHER: Milwaukee's average annual temperature is 46.7°. In late June when you'll be there for AES's 49th Annual Convention, it should be approximately 70° average, 79° high, 62° low.

RESTAURANTS: Eating out? What's your pleasure. You name it and Milwaukee has a restaurant to satisfy it.

INDUSTRY: Though it is known as the "Brewing Capital of the World," Milwaukee's leading single industry is manufacturing equipment for generating, transmitting and distributing electric power.

TRANSPORTATION: Six top railroad systems and two interstate bus lines serve it. With beautiful General Mitchell Field as their terminal, five major airlines alone schedule 100 outbound flights daily to 90 per cent of America's metropolitan centers.

RECREATION: Milwaukee is more than the doorway to vacation land; it is a superb recreation center itself. Among much other relaxational fare, you'll be able to enjoy golf—or swim—or watch Milwaukee's Braves, including Warren Spahn and other stars, etc.

POINTS OF INTEREST: Legion in number, these include, for instance, Mitchell Field; City Hall; Municipal Building; County Stadium, the home of the "Braves"; Lincoln Memorial Drive; The War Memorial; the Milwaukee Art Center; the Yacht Club; the Gun Club; the Water Purification Plant and, of course, famed Bradford Beach, the municipality's finest bathing beach.

PLAN NOW TO ATTEND AES'S MILWAUKEE CONVENTION, JUNE 24-28, 1962

CONSTITUTION

of the

AMERICAN ELECTROPLATERS' SOCIETY

(As of June 22, 1961)

PREAMBLE

NAME, OBJECT, AND DIVISIONS

This society shall be known as American Electroplaters' Society, Incorporated, hereinafter called the Society. It shall be incorporated under the laws of the State of New Jersey.

The object of the Society shall be the improvement and dissemination of the knowledge of the arts and sciences of electroplating and of finishing of metals and of allied arts, the development of a cooperative spirit of friendship, and mutual assistance among its members.

The Society shall consist of members duly elected to membership under the Constitution and By-Laws. There shall be branch or local societies, hereinafter called Branches, duly organized under the Constitution and By-Laws as integral parts of the Society. The Branches shall consist of members of the Society who have become members of the Branches of their choice through the procedures established by the said Branches under the provisions of this Constitution.

There shall be a governing body called the Supreme Society, consisting of Delegates duly elected by the several Branches.

There shall be an Executive Board, duly elected by the Supreme Society in accordance with the Constitution and By-Laws.

PART I. THE SOCIETY

ARTICLE I. FUNCTIONS

Section 1. Organization: The Supreme Society shall consist of three Active Members in good standing from each Branch in good standing, hereinafter called Delegates, whose credentials have been duly accepted. An elected Officer of the Society shall automatically be one of the three Delegates from his Branch. A quorum for the transaction of the business of the Supreme Society shall be two-thirds of the Delegates, present in person or by proxy.

The Executive Board shall consist of the President, the Past President, the First Vice President, the Second Vice President, and the Third Vice President. A quorum for the transaction of the business of the Executive Board shall be four of the above-named Officers.

Section 2. Authority: The Supreme Society shall be the governing body of the Society, and all Branches shall be subject to the laws by it enacted. Its decisions shall be final.

The Executive Board shall be the administrative body of the Supreme Society. It shall conduct the ordinary business of the Society under the provisions of the Constitution and By-Laws and the rulings of the Supreme Society. Its decisions shall be subject to review by the Supreme Society.

ARTICLE II. MEMBERSHIP

Section 1. Members: Any person interested in the object of the Society may become a member.

Section 2. Classes of Membership: The Society shall consist of Active Members, Student Members, Sustaining Members, and Honorary Members.

Section 3. Active Members: Any person interested in the object of the Society may be elected an Active Member.

Section 4. Student Members: Any person not over twenty-five years of age, regularly enrolled in full-time courses at any accredited university or other institution of learning and interested in the object of the Society may be elected a Student Member.

Section 5. Honorary Members: Honorary Membership may be conferred by majority vote of the Supreme Society in Annual Meeting upon any person whose knowledge and outstanding service have enhanced the welfare of the Society. A Branch desirous of having any person elected Honorary Member shall nominate that person, with appropriate information in support of his eligibility, to the Executive Board. If a majority of the Executive Board approve the nomination, it shall be presented for vote to the Supreme Society at the next Annual Meeting.

Section 6. Sustaining Members: Any

firm or person interested in the electroplating and metal-finishing industry or in the object of the Society may be elected a Sustaining Member by majority vote of the Executive Board.

An Active Member may also be a Sustaining Member.

Section 7. Privileges: Student Members and Sustaining Members shall have all rights of membership except those of voting and holding office. Members not belonging to Branches shall have all rights of membership except holding office or election as Delegates.

Section 8. Branch Membership: Application for membership in a Branch shall be made by the candidate for admission to the Branch Secretary on the official form accompanied by the application fee. The Branch Secretary shall submit the application to the Board of Managers or other established body of the Branch, which shall investigate the references of the candidate and approve or disapprove the application by majority vote. An approved application shall at the next regular meeting of the Branch be submitted to the Branch for action. The Branch Secretary shall immediately notify the Executive Secretary of the election of any new member.

Section 9. Membership-at-Large: A candidate for membership not desiring membership in any Branch may become a Member-at-Large. However, Membership-at-Large shall be held to 25 per cent of the entire membership of the Society and when the Membership-at-Large shall equal 25 per cent of the total membership of the Society, Membership-at-Large shall be closed until increase in total membership warrants reopening. Application for Membership-at-Large in the Society shall be made to the Executive Secretary on the official form accompanied by the application fee. The Executive Secretary shall submit the application to the Executive Board, which shall investigate the references of the candidate and shall within thirty days of receipt of application admit or reject the candidate by majority vote.

Section 10. Obligation: Each applicant for membership shall receive a copy of the Constitution and By-Laws and shall read and accept same. He shall not be permitted to plead ignorance in extenuation of any violation of their provisions.

Section 11. Transfer: A member in good standing may transfer from one Branch to another Branch, from Membership-at-Large to membership in a Branch, or from membership in a Branch to Membership-at-Large, with the consent of the governing bodies involved and through such procedure of transfer as may be established by the Executive Board of the Society.

Section 12. Resignation: A member shall be permitted to resign from the Society only when his dues shall have been paid in full to date of resignation.

Section 13. Expulsion: A member having made false or misleading statements in applying for membership or having acted in violation of the Constitution may be expelled from the Society by the Branch, or in the case of a Member-at-Large by the Executive Board, and all monies received from him shall be forfeited by him. However, before acting upon any measure of expulsion, the Branch or the Executive Board, as the case may be, shall provide the alleged offender with full and due opportunity to defend himself in open hearing against the charges brought against him.

Section 14. Reinstatement: Any former member of the Society who may wish to be reinstated shall be considered a new candidate for membership.

Article III. Duties of Members

Section 1. Voting: Delegates may vote in person or by proxy at the Annual Meeting of the Supreme Society. Each Branch shall be entitled to three votes, provided that at least one Delegate or Alternate is present to cast the votes of the entire delegation. The Branch delegation of which a presiding officer is a member may replace him with an Alternate on the floor of a meeting. The presiding officer at a meeting of the Supreme Society may cast a deciding vote in case of tie.

Section 2. Proxies: A Delegate or Delegates may exercise the proxy of any Delegate elected by the Branch, and the Delegates of any Branch may represent not more than one other Branch by proxies duly presented to the Credentials Committee and accepted by the Supreme Society.

Article IV. Officers

Section 1. Roster: The Officers of the Society shall be Past President, President, First Vice President, Second Vice President, Third Vice President, Executive Secretary, and Residing Legal Officer. A member residing in New Jersey shall be Residing Legal Officer of the Society in the State of New Jersey. The Executive Secretary and Residing Legal Officer shall be appointed by the Executive Board, and each shall serve until his successor shall have been appointed and takes office. All other Officers of the Society except the Past President shall be elected.

Section 2. Qualifications: Each Officer of the Society shall be an Active Member of the Society in good standing. Each elected Officer shall further be a Delegate. Each candidate for elective office shall be a Delegate (or Alternate) elected or appointed at a regular Branch meeting. The President of the Society shall before election have served at least one term on the Executive Board.

Section 3. Term: The term of an elected Officer shall be for one year or until his successor shall have been elected or appointed and installed. No person shall hold the same elective office more than two terms in succession.

Section 4. Vacancy: In the event of a vacancy in the office of President, the Vice President highest in rank shall succeed.

Section 5. Past President: The retiring President shall become the Past President of the Society.

Article V. Finance

Section 1. Application Fees: The minimum application fee shall be five dollars. Application fee shall be submitted with each application for membership and paid to the Branch, or in case of application for Membership-at-Large to the Supreme Society.

Section 2. Annual Dues: (a) The minimum annual dues of Active Members of North American Branches shall be ten dollars and eighty cents. Those of Active Members of Branches not in continental North America shall be nine dollars. (b) One dollar of the annual dues of each such Active Member shall be used to support research. (c) The minimum annual dues of Student Members shall be five dollars. (d) The minimum annual dues of Sustaining Members shall be one hundred dollars and shall be paid to the Executive Secretary. (e) The dues of Members-at-Large shall be e'even dollars and shall be paid to the Executive Secretary. (f) Honorary Members shall be exempt from payment of dues.

Section 3. Per Capita Tax: (a) From the annual dues of each Active Member of a North American Branch there shall be paid to the Supreme Society, a Per Capita Tax of seven dollars and fifty cents ($7.50). From the annual dues of each Active Member of a Branch not in continental North America, there shall be paid to the Supreme Society a Per Capita Tax of five dollars and seventy cents ($5.70). (b) Of the Per Capita Tax of each such Active Branch Member two dollars ($2.00) shall be used to pay the annual subscription to the official journal of the Society and one dollar ($1.00) shall be paid into the Research Fund. (c) From the annual dues of each Sustaining Member there shall be paid to the Supreme Society, a Per Capita Tax of four dollars and seventy cents ($4.70), of which two dollars ($2.00) shall be used to pay the annual subscription to the official journal of the Society.

Section 4. Fiscal Year: The fiscal year of the Society shall commence on the first day of July. All financial reports shall be made from and all transactions closed to conform with the end of the fiscal year on the thirtieth day of June.

Article VI. Meetings

Section 1. Annual Meeting: The Annual Meeting for the transaction of business of the Supreme Society shall take place during the Annual Convention. The

Annual Meeting and Convention shall be held on dates agreed upon by the Executive Board and the Branch designated to entertain the Convention, hereinafter called the Host Branch. In national emergency the Executive Board may suspend the Annual Meeting and conduct the affairs of the Society and Supreme Society by letter ballot.

Section 2. Special Meetings: A Special Meeting shall be called by the President upon the written application of a majority of the Branches. The purpose of such Special Meeting shall be stated in writing in the application and the Executive Secretary shall send a copy of the said statement to each Delegate. No business not included in the said statement shall be transacted at any Special Meeting.

Article VII. Charters

Section 1. Granting and Voiding: The Executive Board may grant Temporary or Permanent Charters to Branches duly organized under the Constitution and By-Laws. The Executive Board may at its discretion revoke any Temporary Charter. The Supreme Society may on the recommendation of the Executive Board or upon presentation of evidence revoke for cause the Permanent Charter of a Branch.

Section 2. Temporary Charters: A Temporary Charter may be granted to any group, provided that:

It shall have a membership of not less than ten persons eligible for Active Membership in the Society. Any of these persons may be members of an existing Branch.

Each applicant not already a member of the Society shall make application for Active Membership to the Executive Secretary as provided in this Constitution, and applicants already members shall submit evidence of good standing. The requisite number shall be acceptable to the Executive Board.

The applicants shall petition in writing for a Charter, and each applicant shall over his signature pledge loyal support to the Society and obedience to its Constitution and By-Laws.

Section 3. Duration of Temporary Charter: A Temporary Charter shall be in force until a Permanent Charter is granted or until it is revoked by the Executive Board. The Executive Board shall revoke any Temporary Charter if application for a Permanent Charter be not made within one year of issue of the Temporary Charter.

Section 4. Permanent Charter: The Executive Board shall grant a Permanent Charter upon written application to any Branch that has operated for three or more months under a Temporary Charter.

Section 5. Branch Franchise: Charters shall not be granted to more than one Branch in any city.

Article VIII. Official Publications

Section 1. Official Journal: The Society shall publish periodically an official journal which shall contain articles pertaining to the object of the Society, changes in membership, news of the organization and its members and of the industry in general, and other matters of value to the membership. Each member of the Society in good standing shall receive a copy of the official journal for two dollars ($2.00) paid to the Society out of his annual dues. Non-members shall be offered subscription at the regular price.

Section 2. Proceedings: Each member in good standing shall receive a copy of the technical proceedings of the Annual Convention.

Section 3. Minutes of Annual Meetings: Minutes of each meeting of the Supreme Society shall be sent to each Delegate and Alternate and each Branch President and Secretary.

Section 4. Release of Papers: Papers presented before a Branch shall be the property of the authors. With the consent of the authors, a Branch may offer such papers for publication in the official journal of the Society.

PART II. BRANCHES

Article I

Section 1. Names: A Branch shall be known as————Branch of the American Electroplaters' Society, the blank in this name being the name of the city or locality of the Branch.

Section 2. Organization: Branches shall elect their own officers and may operate under any rules or laws of their own choosing not inconsistent with the Constitution and By-Laws of the Society. Any special laws or rules of a Branch shall be filed with the Executive Secretary.

Section 3. Finances: A Branch may receive donations or bequests and may expend or invest the same at its own discretion. A Branch may levy assessments and otherwise raise or collect funds for its own purposes and shall have the entire use and management of such funds.

PART III. REVISION OF CONSTITUTION

Article I

Section 1. Authority: This Constitution or any part thereof may be repealed, altered, annulled, or otherwise amended by a two-thirds vote, either at an Annual Meeting by roll call or by letter ballot, after regular procedure of initiative and notice as provided in Sections 2 and 3 of this Article.

Section 2. Initiative: Due notice shall be given and a vote shall be taken on any revision submitted by four or more Branches or approved by the Executive Board.

Section 3. Notice: On receipt of a revision duly submitted, the Executive Board shall immediately cause such revision to be reviewed by the authority constituted for that purpose, properly worded and classified, and published in the official journal of the Society at the first opportunity and in any case not later than three months from receipt of the said revision. Vote of the Delegates on the revision shall be taken within three months of its publication in the official journal.

BY-LAWS

(As of June 22, 1961)

PART I. THE SOCIETY

Article I. Election of Officers

Section 1. Time and Method: The Officers of the Society shall be elected during the Annual Meeting by roll call of the Delegates after nomination and second from the floor. A Delegate nominating any candidate for office in the absence from the floor of the said candidate shall vouch for the willingness of the said candidate to serve if elected.

Section 2. Majority Vote: A candidate receiving a majority of votes cast shall be declared elected. In case of no majority on a first roll call, the candidate receiving the fewest votes shall be dropped from consideration and another vote taken; and this procedure shall be repeated until a majority vote shall have been cast for one candidate.

Section 3. Installation: Installation of Officers shall take place immediately after their election.

Article II. Duties of Officers

Section 1. Reports: Each Officer of the Society shall make a report of his activities to the Annual Convention.

Section 2. President: It shall be the duty of the President to preside over all meetings of the Society, to preserve order, to put all proper motions before the meeting if duly seconded, to decide all questions of order subject to appeal to the meeting, and to cast the deciding vote in case of tie. He shall be Chairman of the Executive

Board. In honor of his office he shall be a member of all committees. He shall call all Special Meetings of the Society and all meetings of the Executive Board. He shall appoint all committees not otherwise provided for. He shall be responsible for all expenditures made by the Executive Secretary. When an Officer resigns or dies the President shall, with the approval of the Executive Board, appoint a qualified member of the Society to fill the vacancy for the unexpired term. He shall be Chairman of the Selection Committee of the Charles Henry Proctor Memorial Leadership Award.

Section 3. First Vice President: The First Vice President shall perform the duties of President in case of death, resignation, or absence of the President. He shall be a member of the Educational Committee and shall perform such other duties as may be assigned him by the President or the Executive Board.

Section 4. Second Vice President: The Second Vice President shall perform the duties of President in the absence of the President and First Vice President. He shall be a member of the Membership Committee and shall perform such other duties as may be assigned him by the President or the Executive Board.

Section 5. Third Vice President: The Third Vice President shall perform the duties of President in the absence of the President and First and Second Vice Presidents and such other duties as may be assigned him by the President or the Executive Board. He shall be a member of the Exhibit Awards Committee.

Section 6. Executive Board: The Executive Board shall meet at the call of the President at intervals of not more than four months. The President shall send to each Board member, thirty days prior to the meeting, an agenda of the items of business to be considered. No proposals, other than those on the agenda, can be brought before the Board, except by unanimous consent of the Board. It shall conduct promptly and diligently the ordinary business of the Society. It shall review nominations for Honorary Membership and be responsible for the election of Sustaining Members and the election and expulsion of Members-at-Large. It shall grant all Charters and may revoke Temporary Charters. It shall prepare the Budget and faithfully oversee the finances of the Society, and shall be responsible for audit of the accounts of the Society by a public accountant for report to the Annual Meeting and at any other times it may deem necessary. It shall oversee disbursement of all special funds. It shall appoint the Executive Secretary and the Residing Legal Officer and shall have authority over their duties. With the Host Branch, it shall select the date for the Annual Meeting and Convention, and it shall approve plans for these before their execution. It shall receive and transmit proposals for amendment of the Constitution and By-Laws. It shall approve any call for a Special Meeting of the Supreme Society and shall designate the place and time of such meeting. It shall furnish to the Branches the Society Emblem and necessary standard forms on such terms as may be determined by the Supreme Society. It shall carry out such other business as may be referred to it by the President or the Society. In national emergency, it may at its discretion suspend the Annual Meeting and conduct the business of the Supreme Society by letter ballot.

Section 7. Executive Secretary: The Executive Secretary shall be the business officer of the Executive Board and shall be responsible to the Board. He shall conduct the correspondence of the Society with the Branches promptly and diligently and shall maintain an accurate record of the membership of the Society with a view to efficient promotion of the object of the Society. He shall keep accurate record of the proceedings of the Supreme Society and of the Executive Board. He shall promptly inform the Branches, by whatever means he deems best, of the important proceedings of the Executive Board. He shall supply to each newly elected member a copy of the Constitution and By-Laws of the Society. He shall receive all funds of the Society, shall deposit said funds as directed by the Executive Board, and shall pay promptly with the approval of the President all bills presented to him for payment from the General and Special Funds and shall make disbursements from the Research Fund with the approval of the Research Committee. He shall receive and give receipt for all funds paid to the Society by the Branches. He shall keep such books of account as the Executive Board shall direct. He shall be Chairman of the Employment Committee. He shall preserve for ready access all papers and documents pertaining to his office. He shall be Managing Editor of the official journal; as such he shall appoint the members of the editorial staff, see to the editing and publication of such matter as the Society shall direct and to the copyright of appropriate publications of the Society, and preserve for ready access all valuable papers submitted by members and Branches. He may arrange exchange of publications with other appropriate journals and institutions. He may release papers presented at the Annual Meeting for publication outside the Society with proper credit and may at his discretion release papers not published by the Society. He shall have charge of advertising in the official journal. He shall distribute the official journal to the members of the Society. His salary shall be fixed by the Executive Board, subject to approval by the Supreme Society. He shall furnish the bonds required by the Executive Board. He shall be a member *ex-officio* of the Convention Committee and shall arrange for audit of the accounts of all Conventions. He shall be responsible for all matters pertaining to the publication of the Annual Convention program. He shall be Secretary of the Research Committee and shall be a member of the Public Relations Committee. He shall poll the Delegates for nominations for Honorary Member and shall provide certificates for those elected. He shall be a member of the Selection Committee of the Charles Henry Proctor Memorial Leadership Award.

Section 8. Residing Legal Officer: The Residing Legal Officer shall establish the legal residence of the Society as required by the Laws of the State of New Jersey. He shall carry out such duties pertaining to his office as may be assigned him by the Executive Board.

Article III. Committees

Section 1. Appointment: As soon as feasible after his election the President shall appoint all necessary committees not otherwise provided for. Unless otherwise specified, all members of these committees shall be Active Members of the Society.

Section 2. Credentials Committee. The Credentials Committee shall be empowered to accept at any time the credentials of duly elected Delegates, subject to review by the Supreme Society in Annual or Special Meeting (but not in Interim Meeting). In preparation for each Annual or Special Meeting it shall consider all credentials and proxies of Delegates and shall present its findings for action by the Meeting.

Section 3. Law Committee: The Law Committee shall receive all proposed amendments to the Constitution and shall see to it that said amendments are properly worded and classified for immediate publication in the official journal. It may at its discretion consult with the proponents of said amendments for clarification of language and meaning, and in no case shall it so modify an amendment as to alter the intent of said proponents. It shall examine all new rules and laws of the several Branches and Standing Committees, and any amendments thereof, for inconsistencies with the laws of the Society and shall certify those found free of such inconsistencies.

Section 4. Budget Committee: The Executive Board shall be the Budget Committee. It shall submit to the Annual Meeting of the Society a budget of estimated receipts and expenditures for the coming fiscal year. This budget shall provide for the ordinary business of the Society but not for the Research Committee or the official journal, which shall operate as enterprises independent of its provisions. After this or an amended

budget has been approved by the Supreme Society, expenditures shall not be increased by more than 20 per cent in any category without the approval by letter ballot of a majority of the Supreme Society.

Section 5. Research Committee: The Research Committee shall consist of nine members of the Society and the Executive Secretary. It shall operate under its own By-Laws when certified by the Law Committee and approved by the Executive Board. A representative of any technical organization designated by the Executive Board may be invited to participate in an advisory capacity in the work of the Committee. Of the nine members of the Society, three shall be appointed each year by the Executive Board, and the term of each such member shall be three years or until his successor has been appointed and installed. No member shall be appointed to the Committee for more than two consecutive terms. Upon its annual organization, the Committee shall select its Chairman and designate a Sub-Committee on Disbursements. The Executive Secretary shall be Secretary of the Committee.

The Research Committee shall be authorized to solicit funds for research from any source. Such funds and such other monies as are herein so allocated shall be held in the Research Fund by the Executive Secretary and disbursed by him with the approval of the Committee.

The Research Committee shall cooperate with the Executive Board on its general plans for the ensuing year, including those for such cooperation with other societies and institutions as it deems expedient. Upon approval of a plan by the Executive Board, it may carry out the said plan, employing personnel and publishing and distributing results in cooperation with the Executive Secretary.

The Chairman shall call a meeting of the Committee during the Annual Convention and at least one other time during the fiscal year at a place convenient to the membership of the Committee. Reports of the work of the Research Committee shall be made to the Annual Meeting of the Society and as far as feasible to Branch and Regional meetings.

Section 6. Membership Committee: The Membership Committee shall consist of nine members of the Society and the Second Vice President. Of the nine members of the Society, three shall be appointed each year by the Executive Board, and the term of each member shall be three years or until his successor has been appointed and installed. No such member shall be appointed to the Committee for more than two consecutive terms. Upon its annual organization, the Committee shall select its Chairman and Secretary. The Committee shall take appropriate measures to retain and increase the membership of the Branches. An award shall be presented annually to that Branch in each contest group making the largest per cent of gain in membership. Such award shall be purchased by the Society and shall remain the property of the Branch. It shall operate under its own By-Laws when certified by the Law Committee and approved by the Executive Board.

Section 7. Educational Committee: The Educational Committee of the Society shall consist of nine members of the Society and the First Vice President. Of the nine members of the Society, three shall be appointed each year by the Executive Board, and the term of each member shall be three years or until his successor has been appointed and installed. No such member shall be appointed to the Committee for more than two consecutive terms. Upon its annual organization, the Committee shall select its Chairman and Secretary. This Committee shall assist Branches to improve their educational sessions by securing speakers and programs and cooperating in the organization of classes. It shall operate under its own set of By-Laws certified by the Law Committee and approved by the Executive Board.

Section 8. Committee on Paper Awards: A Committee on Paper Awards shall be appointed and shall operate under the rules for the Committee appended to these By-Laws. The said rules may be amended and modified from time to time, as circumstances require, by the Committee with the approval of the Executive Board. No member of the Committee shall be eligible for award.

Section 9. Scientific Achievement Award Committee: The Scientific Achievement Award Committee shall consist of six members, of whom two shall be appointed each year by the Executive Board; and the term of each member shall be three years or until his successor has been appointed and installed. No member shall serve consecutive terms. The Committee shall select its own Chairman and Secretary. It shall select the William Blum Lecturer under the provisions of the Appendix, Section "SCIENTIFIC ACHIEVEMENT AWARD."

Section 10. Employment Committee: The Employment Committee shall consist of the Secretaries of all Branches. The Executive Secretary shall be Chairman. The Committee shall assist employers to secure qualified members of the Society for positions in the industry and shall assist unemployed members to secure employment.

Section 11. Public Relations Committee: The Public Relations Committee shall consist of nine members of the Society and the Executive Secretary. Of the nine members of the Society, three shall be appointed each year by the Executive Board, and the term of each member shall be three years or until his successor has been appointed and installed. No such member shall be appointed to the Committee for more than two consecutive terms. Upon its annual organization, the Committee shall select its Chairman and Secretary. Under the supervision of the Executive Board, the Public Relations Committee shall foster for the Society all possible public relations tending to promote the object of the Society. It shall operate under its own By-Laws when certified by the Law Committee and approved by the Executive Board.

Section 12. Editorial Board: The Editorial Board shall consist of ten members and the Executive Secretary, who in his capacity of Managing Editor of the official journal shall be Chairman. One member shall be appointed by the Host Branch of each Annual Convention and shall hold office for the year terminating at that Convention. Of the nine remaining members, three shall be appointed each year by the Executive Board on nomination by the Editorial Board, and the term of each such member shall be three years or until his successor has been appointed and installed. No member shall be appointed for consecutive three-year terms.

The Editorial Board shall be responsible for the Educational Sessions at Annual Conventions and shall assist the Managing Editor of the official journal in the determination of policy and the procurement of material.

Section 13. Publications Committee: The Publications Committee shall consist of nine members of the Society and the President. Of the nine members of the Society, three shall be appointed each year by the Executive Board, and the term of each such member shall be three years or until his successor has been appointed and installed. No member shall be appointed to the Committee for more than two consecutive terms. Upon its annual organization, the Committee shall select its Chairman and Secretary.

The Publications Committee shall study and select subjects relative to the interests of the membership of the Society, and consonant with its aims, which are of sufficient magnitude and timely interest to justify publication in book form. It shall recommend to the Executive Board ways and means of collecting material for such books and upon Executive Board approval shall select and assist the editors and authors thereof.

It shall operate under its own By-Laws when certified by the Law Committee and approved by the Executive Board.

Section 14. Honorary Membership Committee: The Honorary Membership Committee shall consist of four members of the Society of whom two shall have been Presidents of the Society and the remaining two shall be Delegates or Alternates who have answered roll calls at Annual Meeting for five or more years. One member of each group shall be appointed each year by the Executive Board, and the term of each member shall be two

years or until his successor has been appointed and installed. Upon its annual organization, the Committee shall select its Chairman and Secretary. In case of a tie vote the President of the Society shall cast a deciding ballot.

Upon receipt from the Executive Secretary of Branch nominations for Honorary Membership, the Committee shall review the qualifications of each nominee under the rules published in the Appendix of these By-Laws and shall report its findings to the Executive Board before January 1 of the following year.

Article IV. Funds

Section 1. General Fund: All income of the Society other than hereinafter specified shall be held in the General Fund.

Section 2. Special Funds: All monies collected for special purposes shall be held by the Executive Secretary in separate accounts. Such monies shall not be expended except for the specified purposes unless by majority vote of the Supreme Society.

Section 3. Research Fund: All income received from Sustaining Memberships, after deduction of Per Capita Tax, and all other monies specifically designated for research shall be held by the Executive Secretary in the Research Fund and shall be expended only under direction of the Research Committee.

Article V. Dues

Section 1. Collection: Dues shall be paid in advance for the fiscal year and are payable on the first of July. Dues are payable annually in one installment, except that a member elected during the fiscal year shall pay only for the quarters remaining of that year, including that in which elected.

Members of Branches shall pay dues to the Branches. The Executive Secretary shall be responsible for collection of dues from Members-at-Large and Sustaining Members.

Section 2. Suspensions: A member for whom Per Capita Tax has not been paid on September 1 for the fiscal year beginning July 1 of the same calendar year shall be considered suspended until said tax shall be paid and shall not receive the official journal or other publications of the Society during suspension.

Section 3. Per Capita Tax: From the annual dues there shall be paid a Per Capita Tax of seven dollars and fifty cents ($7.50) for each Active Member in good standing of a North American Branch and of five dollars and seventy cents ($5.70) for each such member of a Branch not in continental North America. The tax shall be paid annually, not later than the first day of September; except that for each new member of a Branch there shall be paid upon his election a tax proportionate to the number of quarters remaining of that fiscal year, including that in which he is elected. If a Branch tax remains unpaid after thirty days from due date, Executive Secretary shall demand payment in writing, and if the tax remains unpaid after the thirty days following such demand, the Branch shall be considered not in good standing and its members shall not receive any benefits or publications of the Society until the said tax is paid. A Branch whose tax for any fiscal year shall remain unpaid thirty days after the beginning of the following fiscal year may by action of the Executive Board be suspended, and persistent failure to pay shall be grounds for revoking a Branch Charter by the Supreme Society.

Section 4. Special Per Capita Tax: The Supreme Society may by two-thirds vote of all delegates assess a Special Per Capita Tax upon the Society; but the total of such Special Per Capita Taxes shall not in any fiscal year exceed 10 per cent of the established minimum dues.

Article VI. Meetings and Conventions

Section 1. Place: The Annual Convention shall be held at a place selected by the Delegates at a previous Annual Meeting. Invitations from Branches shall be announced at the Annual Meeting. When two or more Branches present invitations, selection shall be by roll call vote. In the event of no invitation, or if for valid reason the place must be changed, the Executive Board shall select a suitable place with the consent and cooperation of a Branch or Branches.

Section 2. Order of Business: The Regular Order of Business of the Annual Meeting shall be that published in the Appendix to these By-Laws and shall not be suspended except by two-thirds vote of the Delegates present and voting.

Section 3. Alternates: The proxy of any Delegate may be exercised on the floor of a meeting by any duly accredited Delegate of his Branch. A Branch may cast a number of votes equal to the number of its duly accredited Delegates provided that it has one such Delegate (or accredited Alternate) present on the floor.

Section 4. Privilege of the Floor: The President or presiding officer, by unanimous consent, may grant the floor of an Annual Meeting to any person.

Section 5. Parliamentary Authority: Robert's Rules of Order shall be the parliamentary authority of the Society in all matters not especially covered in the Constitution and By-Laws or in special enactments of the Society.

Section 6. Convention Committee: The Convention Committee shall consist of members of the Host Branch and the Executive Secretary. It shall conduct the business of the Convention. At least ten months before the Convention it shall submit to the Executive Board for approval a plan for the Convention, including any proposed exhibits. At least four months before the Convention, it shall submit to the Executive Board for approval its final plans and budget. The Registration Fee of the Convention shall be determined by the Host Branch with the approval of the Executive Board.

Section 7. Finance: The Executive Secretary shall arrange for audit of all accounts and approve all financial arrangements. The Society shall be financially responsible for any deficit. All monies collected in connection with the Convention, by any means whatsoever, shall be available to defray the expenses of the Convention and associated enterprises. Any profit accruing after payment of all expenses shall be divided 50 per cent, but not more than one thousand dollars ($1,000), to the Host Branch and the remainder to the Society. Final audit shall be submitted to the Executive Board within ninety days after the Convention, and all sums due the Society shall be paid within that time.

Section 8. Exhibits: The Executive Board may at its discretion recommend to the Convention the date and place of an exhibit of manufacturers' products and of the accompanying Annual Convention. At any Annual Convention, exhibits by Branches or individual members of the Society may be invited or authorized at the discretion and under the direction of the Executive Board.

Section 9. Interim Meetings: There shall be an annual Interim Meeting of the Supreme Society at a time and place selected by the Supreme Society, for the purpose of hearing reports and proposals, of considering all matters referred to it by the Annual Meeting, and of making recommendations to the Annual Meeting and the Executive Board concerning these and other matters which may come before it. No action of any Interim Meeting shall be binding on the Society.

PART II. BRANCHES

Article I. Authority

A Branch shall operate in accordance with its Charter and with this Constitution and By-Laws. Within the provisions of the said Charter, Constitution, and By-Laws, a Branch shall conduct its own business as it sees fit under such By-Laws as it may establish.

Each Branch shall file with the Executive Secretary copies of its By-Laws and of any amendments thereto.

Article II. Meetings

Section 1. Time and Place: The Branch shall hold regular meetings on stated days at a time and place approved by a majority of the members.

Section 2. Object: The Regular Meetings shall provide for the presentation

and discussion of papers on electroplating or allied subjects and for the transaction of any business that may be brought before the meeting in furtherance of the object of the Society.

Section 3. Special and Regional Meetings: A Branch may hold special meetings and join in regional meetings under the provisions of its own rules.

Article III. Duties of Branches

Section 1. Membership Applications: The Branch shall keep a record of the names of all applicants for membership. It shall establish a Board of Managers or other board which shall review the record of each applicant and approve or disapprove his election.

Section 2. Branch Supplies: The Branch shall use standard forms of application blank, membership card, certificate, Constitution of the Society, and such other matter as may be designated by the Executive Board.

Section 3. Reports: Within seven days of each meeting the Branch shall forward to the Executive Secretary a report of the meeting and copies of all appropriate papers offered for publication by the Society.

Article IV. Organization

Section 1. Officers: The Officers of a Branch shall be President, First Vice President, Second Vice President, Secretary, Treasurer (or Secretary-Treasurer), Branch Educational Chairman, and the three or more members of the Board of Managers.

Section 2. Qualifications: Any member of a Branch who is in good standing may be elected an officer.

Section 3. Election and Term: Officers shall be elected by such procedure as the Branch may establish and shall hold office for one year, or until their successors have been elected and installed.

Article V. Duties of Officers

Section 1. President: The Branch President shall preside at all meetings, preserve order, put all proper motions before the meeting if duly seconded, and decide all questions of order subject to appeal to the meeting. He may cast the deciding vote in case of a tie. He shall in honor of his office be a member of all committees. He shall appoint all committees not otherwise provided for. In the absence of any officer he shall appoint a member to act in his place. He shall call all necessary meetings of the Board of Managers.

Section 2. First Vice President: The First Vice President shall perform the duties of the President in the event of absence, death, or resignation of the President. He shall have charge of promoting the growth of the membership of the Branch and shall perform such other duties as may be properly assigned him.

Section 3. Second Vice President: The Second Vice President shall perform the duties of the First Vice President in the event of absence, death, or resignation of the First Vice President. He shall perform such other duties as may be properly assigned him.

Section 4. Secretary: The Secretary shall keep accurate record of all meetings of the Branch and within seven days of each meeting shall forward to the Executive Secretary a record of the meeting and copies of all appropriate papers offered for publication by the Society. He shall receive, record, and transmit for review to the Board of Managers the applications of prospective members. He shall by July 15 file with the Executive Secretary a correct list of Branch members in good standing on June 30 and shall notify the Executive Secretary monthly of any changes and additions. He shall be a member of the Employment Committee of the Society. He shall conduct the correspondence of the Branch. He shall maintain a supply of standard forms of the Society. He shall keep itemized account of the receipts and expenditures of his office and perform such other duties as may be properly assigned him. He may be paid such compensation as the Branch shall approve.

Section 5. Treasurer: The Treasurer shall receive all funds of the Branch and deposit them as directed by the Branch. He shall pay all bills properly presented for payment under the laws of the Branch and shall sign all checks. He shall give receipt for all monies received and shall keep books of account correctly posted and ready for audit. If unable to attend any meeting of the Branch, he shall arrange for a competent deputy. He shall be bonded in a sum not less than the total of funds in his charge. He may be paid such compensation as the Branch shall approve.

Before the first day of September the Treasurer shall remit to the Executive Secretary of the Society the Per Capita Tax due for each member of the Branch; and he shall subsequently remit upon the election of a new member a Per Capita Tax proportionate to the number of quarters remaining of the fiscal year. He shall remit to the Executive Secretary the proceeds of any duly levied Special Per Capita Tax.

Section 6. Branch Educational Chairman: The Branch Educational Chairman shall provide for suitable topics of discussion, speakers, and papers for the meetings of the Branch. He shall have charge of the Question Box and of all magazines, books, and similar property of the Branch. He shall ordinarily be a representative of the Educational Committee of the Society.

Section 7. Board of Managers: The Board of Managers shall conduct the ordinary business of the Branch, referring appropriate items to the Branch. It shall supervise the property and expenditures of the Branch and shall be a standing committee for consideration of any matters referred to it. It shall examine the records of all applicants for membership and recommend to the Branch the election or rejection, as the case may be, of each.

Section 8. Property: An officer holding property of the Branch shall surrender the said property upon installation of his successor or demand of the Board of Managers.

Section 9. Reports: Every officer shall at the end of his term of office or upon his resignation submit a written report of his official transactions.

Section 10. Resignations and Vacancies: An officer intending to resign shall so notify the Branch President in writing at least one month before the effective date of his resignation. A vacancy in any office shall be filled by the Branch at the first regular meeting after occurrence of said vacancy.

Article VI. Duties of Members

Section 1. Voting: Every member shall vote when required to do so by the presiding officer of a Branch meeting.

Section 2. Misuse of Membership: No member, be he Branch member or Member-at-Large, shall use, or sanction the use of, the name or insignia of the Society or his membership in the Society or Branch in the advertising of any product or service. Violation of this provision shall be grounds for expulsion from the Society.

Article VII. Representation

Section 1. Delegates: Each Branch shall be entitled to three Delegates in the Supreme Society, who shall be members in good standing of the Branch and shall be elected by the Branch to take office at the first regular Branch meeting following the Annual Meeting of the Supreme Society. Alternates may also be elected, who may exercise the proxies of Delegates in the absence of the Delegates. Any Branch member holding national office shall automatically be one of the three Delegates of his Branch. The President and Secretary of the Branch shall certify credentials of Delegates and Alternates and shall forward copies of the said credentials to the Executive Secretary so as to reach him by not later than the first Monday in November. Delegates shall serve until their successors are duly elected and accredited. Delegates and Alternates, immediately upon their accreditation, shall be provided with a booklet by the Executive Secretary describing the duties of Delegates. This booklet, to be printed by the National Office, shall contain that section

of duties of Delegates from the Branch Officers Manual.

A Branch may be represented at the Annual Meeting by proxies exercised by Delegates of another Branch; provided that no Branch shall exercise the proxies of more than one other Branch. The said proxies shall be in force only during the Annual Meeting for which they are issued, after due presentation to the Credentials Committee and acceptance by the Delegates.

Section 2. Instruction: A Branch may instruct its Delegates in regard to their votes on the agenda of the Society and the election of Officers, and the Delegates shall vote as instructed for such period as the Branch may direct.

Article VIII. Dues

Section 1. Amount: The minimum annual dues of Active Members of North American Branches shall be ten dollars and eighty cents ($10.80)and of Branches not in continental North America nine dollars ($9.00). The minimum annual dues of Student Members shall be five dollars ($5.00). New members shall on election pay dues for the number of quarters remaining in the fiscal year during which they are elected, including those quarters in which they are elected.

Section 2. Expulsion: Members whose dues for the previous fiscal year are not paid at the end of any fiscal year may be expelled on recommendation of the Board of Managers and majority vote of the Branch. Such members may be again received into membership only upon due application accompanied by Application Fee and further payment of arrears acceptable to the Board of Managers.

Section 3. Transfer: No member shall transfer from one Branch to another unless he is in good financial standing.

PART III. REVISION

These By-Laws or any part thereof may be repealed, altered, annulled, suspended, or amended by two-thirds vote, either at an Annual Meeting by roll call or by letter ballot.

APPENDIX

ANNUAL MEETING

Order of Business

Opening of Convention: Chairman, Convention Program Committee
Address: President, Host Branch
Addresses: Guest Speakers and Others
Final Address of Opening: President of the Society
Turning-Over of Convention to President of the Society: Convention Chairman
Call to Order
Seating of Delegates in Reserved Sections
Roll Call of Officers
Roll Call of Delegates
Introduction of Distinguished Guests
Memorial to Deceased Members
Report of Credentials Committee, Action on Report and Appeals Therefrom
Report of the President
Reports of Vice Presidents
Report of Executive Secretary
Report of Chairman, Research Committee
Report of Secretary-Treasurer, Research Fund
Reports of Standing and Special Committees
Appointment of Election Committee
Appointment of Standing Committees
Presentation and Reading of Proposed Revisions of Constitution and By-Laws

Final Business Session

Roll Call of Officers
Roll Call of Delegates
Report of Audit of Books
Report of Paper Awards Committee
Report of Law Committee
Action on Proposed Revisions of Constitution and By-Laws
Report of Budget Committee
Action on Budget
New Business
Report of Resolutions Committee
Nomination and Election of Officers
Selection of Place of Convention
Adjournment

PAPER AWARDS

1. *Committee on Paper Awards:* The committee on Paper Awards shall consist of not less than three nor more than five members and shall be separate and distinct from the Committee on Exhibit Awards. No two members of the committee shall be members of any one Branch. The Chairman of the Committee shall be appointed by the President within 60 days from the adjournment of the Convention. The other members of the committee shall be appointed by the President from a panel submitted by the Chairman. This panel shall contain the names of twice the number of members to be appointed.

2. *Awards:* The following paper awards may be made:

(a) The Carl E. Heussner Award, consisting of the AES Gold Medal, $250, and an Award Certificate, for the best paper printed in Society publications during the fiscal year. (Co-sponsored by the Society and United Platers' Foundation, Glenn H. Friedt, Trustee.)

(b) The AES Silver Medal for the second best Plating or Convention paper during the fiscal year. Cash award: $150.

(c) The AES Bronze Medal for the third best Plating or Convention paper during the fiscal year. Cash award: $50.

(d) The George B. Hogaboom Memorial Award, consisting of $75.00 and an Award Certificate, for the best paper on nickel plating printed in Society publications during the fiscal year. (Co-sponsored by the Society and the Hartford Branch.)

(e) The Robert S. Leather Mechanical Finishing Award of the American Electroplaters' Society, sponsored by the Lea Manufacturing Company and consisting of $50.00 and a certificate, for the best paper on the subject of mechanical finishing appearing in Society publications during the fiscal year.

(f) The Chromium Plating Award of the American Electroplaters' Society, sponsored by the Nutmeg Chrome Corporation and consisting of $50.00 and a certificate, for the best paper on the subject of chromium plating appearing in Society publications during the fiscal year.

(g) The Precious Metal Plating Award of AES, consisting of $50 and an Award Certificate for the best paper on the plating of platinum, palladium, rhodium, iridium, ruthenium, gold or silver appearing in the Society's publications during the fiscal year. (Sponsored by the International Nickel Company, Inc.)

(h) The John J. Hanney Memorial Award consisting of $75.00 and an Award Certificate, for the best paper on copper plating printed in Society publications during the fiscal year. (Co-sponsored by the Society, its Grand Rapids Branch and the Metal & Thermit Corporation.)

(i) The Zinc Award of AES, consisting of $50 and an Award Certificate, for the best paper on the plating of zinc die castings appearing in the AES's publications during the fiscal year. (Sponsored by the American Zinc Institute.)

(j) The Organic Finishing Award of AES, consisting of $50 and an Award Certificate for the best paper on the subject of organic finishing appearing in the Society's publications during the fiscal year. (Sponsored by the O'Brien Corporation of South Bend, Indiana, Industrial Finishing Division.)

(k) The Aluminum Finishing Award of AES, consisting of $100 and an Award Certificate for the best paper on the subject of finishing of aluminum appearing in the Society's publications during the fiscal year. (Sponsored by the Kaiser Aluminum & Chemical Corporation.)

3. *General Consideration for Awards:*

(a) The author of any paper which merits one or more of the Society's paper awards may be any person, not necessarily a member of the Society.

(b) At least three papers in each category should be available for judging. In any year when less than that number of

qualifying papers have been published, it or they are to be held over until at least three accumulate in the succeeding year or years.

(c) When a single paper has more than one author, duplicate medals and/or certificates are to be presented to each author. The cash award, however, will remain unchanged and will be equally divided among the respective winning authors.

(d) If in the judgment of the Paper Awards Committee those papers whose subject matter makes them eligible for any of the special awards, 2 (d), (e), (f), (g), (h), (i), (j) and (k) above, have insufficient merit to deserve the award, the Committee shall announce that no award of 2 (d), (e), (f), (g), (h), (i), (j) and (k) is made for that year. The decisions of the Committee on Paper Awards shall be final.

(e) In judging a paper for an award, the Committee shall completely disregard the author's affiliation, except that no award shall be given for AES Research Reports and no member of the Paper Awards Committee shall be eligible for award.

(f) Papers presented before a Branch during one fiscal year but printed in a Society publication during a following fiscal year, shall be classified in the year in which publication occurs. A paper appearing serially in two or more issues shall be judged in that fiscal year in which the final part is published.

(g) Papers which have received prior presentation before other societies or prior publication outside the publications of the AES shall be considered ineligible for competition. This shall include rewrites of such papers unless the rewrite shall contain new material, in which case the new material shall be eligible for consideration.

4. *Specific Considerations for Award:* In judging eligible papers, the Committee shall use a point system, and, for each award made, the paper receiving the highest number of points shall receive the award. The following considerations and maximum number of points shall apply:

(a) Immediate value to the electroplating industry.....30

This shall be measured by such considerations as:

(1) Its money-saving worth in pointing out economies in existing process
(2) Improvement on existing process
(3) Simplification of control of process or of measurement of quality of product
(4) Novel theoretical considerations leading to a more complete understanding of process
(5) New process for an existing product
(6) New product

(b) Scientific value.....30

This classification is intended to reward papers that appear to have enduring future value, although they might be of small immediate practical value. A paper may receive a high rating under both (a) and (b).

(c) Originality of subject matter or value as a review paper.....30

A paper which is purely a review paper shall be rated as such on the basis of whether the review is of sufficient scope and is so presented as to be of considerable value to a large number of members.

(d) Clarity of presentation.....10

The principal emphasis shall be on presentation of subject matter in a clear understandable manner. Extensive plots, photomicrographs, etc., do not necessarily add to clarity of presentation. The length of the paper shall be considered immaterial.

5. *Announcement of Awards:* The announcement of paper awards shall be made by the Chairman of the Paper Awards Committee at the first business session of the Annual Convention. Presentation of the awards shall be made at that session of the Convention, and winners of awards shall be requested in advance to be present.

6. *Report of the Paper Awards Committee:* By April 1 of the fiscal year, the Chairman shall report to the President of the Society the winners of the awards. The President shall then instruct the Executive Secretary to prepare the various awards for presentation.

(Since the AES fiscal year was changed in 1957 from April-March to July-June, the Committee has judged papers that appeared in 1) the fiscal year's TECHNICAL PROCEEDINGS or 2) March through February issues of PLATING MAGAZINE.)

SCIENTIFIC ACHIEVEMENT AWARD

PURPOSE AND HISTORY

The Scientific Achievement Award was instituted by the American Electroplaters' Society for the purpose of recognizing Society members whose outstanding scientific contributions have advanced the theory and practice of electroplating, metal finishing, and allied arts; have raised the quality of processes and products; or have enhanced the dignity and status of the profession. The award winner will deliver the William Blum Lecture, so named to honor Dr. William Blum, who through his active association with our technical programs contributed greatly in gaining international recognition for the Society as a forum for the discussion of theoretical and practical aspects of electroplating. The lecture was established in 1957. The names of the Scientific Achievement Award Committee members shall be published in the Annual *Technical Proceedings* or its equivalent.

RULES GOVERNING SELECTION OF LECTURER

The Lecturer shall be selected by the Scientific Achievement Award Committee prior to the annual Convention one year preceding presentation of the lecture.

On September 1 preceding the Lecturer's selection the Executive Secretary shall poll the Supreme Society Delegates of Branches in good standing on that date for first and second choice nominations for the award. Each Delegate polled shall be furnished complete information regarding the award and selection of the Lecturer. Nominations shall be closed on October 15. Each nomination shall be accompanied by six copies of a dossier of accomplishments that, in the opinion of the Branch, entitles the candidate to Scientific Achievement Award consideration.

The Executive Secretary shall furnish the Scientific Achievement Award Committee Chairman the names of all nominees by November 1.

The Chairman shall forward the nominees' names with supporting information to the Committee Members by November 15. Each member shall report his choice (if any) to the Chairman by December 15. The Chairman shall re-list the names of all nominees receiving one vote (six names at most) and re-poll the members who shall report their choice (if any) by February 1. The Lecturer is chosen if one nominee receives 4 or more votes. If no nominee receives four votes, a third poll on nominees receiving two or three votes shall be completed by March 1.

The Chairman shall before April 1 furnish the name of the Lecturer and suggest the wording to be inscribed on the scroll to the President, or inform him that none of the nominees had sufficient merit to deserve the award. The identity of the winner shall be kept in confidence until the following Annual Convention. The President shall at that time announce the winner. The decision of the Scientific Achievement Award Committee shall be final.

REQUIREMENTS AND AWARDS

The lecturer shall be a member of the Society with at least 10 years of recognized achievements related to the purpose of the Award. He shall deliver a lecture related to the purpose of the Award during the second technical session of the Annual Convention following that at which his selection was announced. (The Educational Chairman of the Host Branch shall arrange for a single session at the time of the lecture if multiple technical sessions are offered.) Immediately following the lecture, the Lecturer shall receive a cash honorarium of $500.00 (Five Hundred Dollars) and a suitably inscribed scroll. The lecture shall be published in the Annual *Technical Proceedings* or its equivalent. A list of the William Blum Lecturers and the subjects presented shall be published annually in the Annual *Technical Proceedings* or its equivalent.

PROVISIONS FOR AWARD

The Executive Secretary shall provide a scroll inscribed with the name of the Lecturer, the field covered by the lecture, the place and the date of its delivery, signed by the President and members of the Scientific Achievement Award Committee. The cash honorarium shall be provided from the Society's General Fund.

AWARD OF HONORARY MEMBERSHIP

Honorary Membership may be conferred by majority vote of the Supreme Society in Annual Meeting, after nomination by a Branch, review by the Honorary Membership Award Committee, and approval by the Executive Board, upon a member of the Society who has achieved eminence in its field of work or has rendered especially meritorious service to the Society. Qualification for election shall be determined under the Basis of Award which follows below.

On September 1 of each year, the Executive Secretary shall poll the Delegates for Branch nominations. Any nominations offered shall be accompanied by six copies of a statement of qualifications under the Basis of Award. Nominations shall be closed on November 15.

The Executive Secretary shall transmit all nominations and covering statements of qualifications to the Honorary Membership Awards Committee, which shall review the statements and report its findings before February 1 to the Executive Board. In case of a tie, the President of the Society shall cast a deciding ballot.

The Board shall review the report and shall approve for balloting such nominations as it finds properly supported, and these shall be voted upon under New Business at the next Annual Meeting. The nominating Branch shall be notified of any approval and shall have the privilege of presentation of the nominee's name through a Delegate. Not more than three Honorary Memberships shall be elected in any year. No member shall be nominated to Honorary Membership while a member of the Executive Board or a paid employee of the Society.

BASIS OF AWARD

Honorary Membership may be granted annually provided there is a qualified nominee.

The number of Honorary Memberships granted in any one year shall not exceed one per 2,500 members or a fraction thereof.

To qualify, a nominee must have served the National Society with distinction. In considering nominations, the Branch Delegate and Honorary Membership Award Committee shall be guided by the nominee's activities along the following lines:

1) Service as a Delegate to the Supreme Society.

2) Authorship of papers published in Society publications.

3) Service in staging national conventions.

4) Service as a national officer.

5) Chairmanship of committees or boards established by the Executive Board or Supreme Society.

6) Service on committees or boards established by the Executive Board or Supreme Society.

7) Work in organizing and presenting courses in electroplating and metal finishing.

8) Active assistance in organizing a new branch.

9) Outstanding representation of the Society with closely allied groups.

10) Any other distinguished service or contribution to the Society.

PUBLICATION

A list of all Honorary Members of the Society shall be published annually in the Annual Proceedings or its equivalent.

CHARLES HENRY PROCTOR MEMORIAL LEADERSHIP AWARD

1. That the Award shall be exclusively sponsored by Mr. and Mrs. William O. Preston of 34 Lewis Drive, Madison, New Jersey—son-in-law and daughter respectively of the late Charles Henry Proctor.

2. That it shall be designated and hereafter exclusively known as the "CHARLES HENRY PROCTOR MEMORIAL LEADERSHIP AWARD."

3. That it shall be awarded annually to that member in good standing of the American Electroplaters' Society, Inc. (AES), regardless of whether or not a National, Branch or Committee Officer, who during the year, in the judgment of the Selection Committee, demonstrated the most outstanding leadership qualities among nominees by AES Branches and AES Committees, in furthering the objectives of the Society or enhancing its dignity, prestige or progress. Said qualifications, for judging by the Selection Committee, shall be documented as to specific act or acts, whether organizational, administrative, membership promotion, public relations, educational, management or other such elements, singly or collectively.

4. That the annual Award shall consist of a cash award of $150—plus a suitably inscribed and laminated Scroll—plus suitable recognition in PLATING MAGAZINE and in TECHNICAL PROCEEDINGS. Presentation of said Award shall be formally made at the Banquet of the National Convention by the donor if present otherwise by the President of the Society.

5. That nominations for said Award shall be made by AES Branches and AES Boards and Committees by not later than April 1 annually.

6. That the Selection Committee shall be composed of a) Mrs. William O. Preston, the donor, b) the President of the Society, c) the National Executive Secretary of the Society, d) the Chairman of the Order of Past Presidents, e) the Chairman of the Research Committee and f) two Branch Presidents to be selected annually by the Executive Board at its June meeting. Each member of the Committee shall have one vote. Any four affirmative votes shall constitute selection. Selections may be made at a meeting of the Committee or by Letter Ballot. The President of the Society shall be Chairman of the Committee.

7. That the donor shall be billed for a) the cash award ($150) and b) the cost of inscription and lamination of the Scroll, at cost, by National Headquarters not later than one month after the year's selection. In no case shall the aggregate annual expense to the donor exceed $200. In addition, the donor will bear the one-time, non-recurring cost of designing and publishing a stock of scrolls at an expense, at cost, not to exceed $50.

8. That the donor can terminate this Award at will by written notice to the National Executive Secretary one year in advance of desired terminal date.

INTERSOCIETY NEWS

MANUFACTURING CHEMISTS TO MEET IN NEW YORK

The 11th semi-annual meeting and midyear conference of the Manufacturing Chemists' Association, Inc., will be held Nov. 21, 1961, in New York City.

The program, designed to interest senior and junior executives, departmental and staff personnel within the member-firms, will consist of a series of six panels on a wide variety of management topics.

♦

ENGINEERING SOCIETIES OCCUPY NEW BUILDING

All packed up and ready to go, 19 engineering organizations over the Labor Day holiday week-end to the new 20-story, $12,000,000 United Engineering Center on United Nations Plaza, between 47th and 48th Streets, New York City; the Center is owned and operated by United Engineering Trustees, Inc.

Thus, after half a century in the Engineering Societies Building at 25–33 West 39th Street, made possible by a $1,500,000 gift from Andrew Carnegie, the occupants of that structure, and several additional organizations, become a unit of the peace complex exemplified by the United Nations headquarters, and by the Carnegie Endowment for International Peace, directly across, on 47th Street, from the United Engineering Center.

The Center becomes the largest concentration of professional engineering societies in the Free World. Nineteen organizations are the initial occupants, with room available for others in the future. The occupants include the five "Founder Societies"—the American Society of Civil Engineers, the American Institute of Mining, Metallurgical, and Petroleum Engineers, The American Society of Mechanical Engineers, the American Institute of Electrical Engineers, and the American Institute of Chemical Engineers.

Others are: United Engineering Trustees, Inc., American Institute of Consulting Engineers, American Institute of Industrial Engineers, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, American Welding Society, Engineering Foundation, Engineering Index, Engineering Societies Library, Engineers Council for Professional Development, Engineers Joint Council, Illuminating Engineering Society, Society of Women Engineers, The Municipal Engineers of the City of New York, and Welding Research Council.

RECORD ATTENDANCE AT ASTM ANNUAL MEETING

Nuclear Standardization activities; the effects of naturally occurring space radiation on materials; irradiation tests methods, and a concurrent program of symposia highlighted the 64th Annual Meeting of the American Society for Testing Materials in Atlantic City, N. J., June 25–30, 1961. The registration—3462—broke all records for the seventh straight year for an ASTM Annual Meeting. Ladies' registration reached a total of 430.

Forty-one formal technical sessions and symposia and ten informal sessions and panel discussions were held during the meeting.

More than 1000 meetings were held by subcommittees and sub-groups of the ASTM Technical Committees whose task it is to keep ASTM standards up to date and create new ones as needed by industry.

A common aspect of solids, liquids, and ionized gases—that of impurity effects—was treated in the Symposium on Major Effects of Minor Constituents on Properties of Materials sponsored by the Division of Materials Sciences.

In the 1961 Marburg Lecture, Dr. Bruce Chalmers, Gordon McKay professor of metallurgy, Harvard University, and editor of Acta Metallurgica, discussed the theory of static nucleation and the existence of dynamic nucleation processes. How ice crystals form and grow from the melt was examined in terms of the structure of the solid-liquid interface and thermal and chemical conditions. The subject of this lecture had direct implications on the freezing of water in soils, the manufacture of semiconductors, and a host of other applications in the electronics and metallurgy fields.

In the 1961 Gillett Lecture, Augustus B. Kinzel, vice president, research, Union Carbide Corp., discussed the why, how and finality of specifications.

A faster exchange of information between materials scientists and United States industrial and government agencies must be had, because of the mounting flood of technical information now available, if we are to maintain our scientific leadership over Soviet Russia, was the core of the address given by A. Allan Bates, vice president, Portland Cement Assn., as retiring president of ASTM.

Miles N. Clair, president, The Thompson & Lichtner Co., Inc., Brookline, Mass., was elected president of ASTM to serve for one-year term beginning at the close of the Society's week-long meeting.

EXPOSITION TO FORECAST CHEMICAL GROWTH

Forecasts of greater chemical growth will multiply among the massed exhibits at the 28th Exposition of Chemical Industries, to be held at the New York Coliseum, November 27 to December 1.

The chemical process industries are rapidly advancing along the road to increased production at lower cost to the consumer through streamlined equipment, and the shape of things to come will be sharply outlined by the new concepts in method, materials and mechanisms, on display at the Exposition, many of them new.

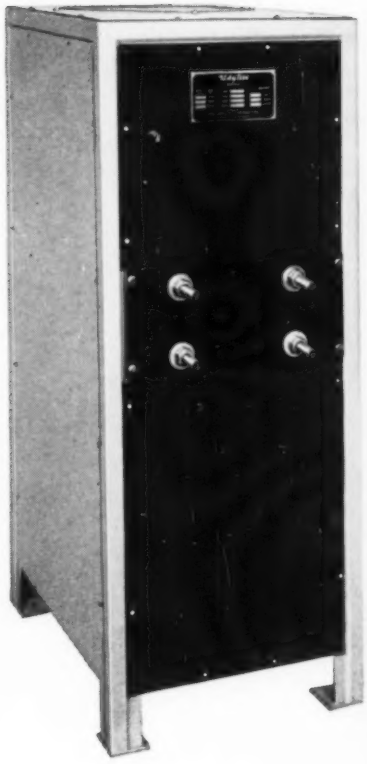
Major fields of interest at the Coliseum will lie in new structural materials, and in the details of new and improved equipment for every chemical processing need.

One entire display at the Exposition will be devoted to the metallurgical, chemical and agricultural uses of cobalt, with interest centered on samples of the metal itself in high purity form (zone-refined and electron bombarded) and in high-temperature alloys for aircraft engines. To demonstrate the versatility of the metal, samples will also be shown of magnets, springs, dental alloys, castings and cutting tools; also glass-to-metal seals, driers for paints, varnishes and inks, as well as catalysts and cobalt "bullets".

All metals which can be woven into wire cloth will be on display, including filter leaves, industrial wire cloth, wire cloth fabrications and parts, also plastic-coated wire cloth.

Specially developed for electrochemical processing is a line of filters, pumps, agitators and skimmers incorporating epoxy pumps and polypropylene pump chambers with titanium shafts. Such equipment is rated to handle chromic acid up to 200F. Metal finishing, photo processing, electrotyping, ultrasonic cleaning, electroforming and radioactive solutions are other uses such equipment is designed to handle. The same exhibitor will also offer an ion exchanger developed to recover gold from electroplating rinse tanks.

Substantially every type of equipment employed by the chemical processing industries will be represented at the Exposition from the storage and handling of raw materials and carrying on through sizing, classification, mixing, blending, heating, cooling and the many other common treatments, as well as many special processing techniques.



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NEW PROJECT ALERT RECTIFIER PROGRAM

Rebuild your old equipment now!

Now's the right time to let Udylite electrical equipment specialists rebuild your old, inefficient, 6-, 9- and 12-volt UM and UV rectifiers. You can obtain all of the advantages of a completely new silicon unit at a cost just slightly more than a silicon diode replacement kit. With the exception of the transformer, you'll have *a brand new rectifier from top to bottom.*

NEW, MODERN CABINET features slotted side panels for easy removal and replacement.

UNIFRAME CONSTRUCTION gives increased ruggedness, reduces overall weight.

NEW DIODE ASSEMBLY has newly-designed, one-piece, solid copper, finned heat sink and improved, non-aging silicon diodes with ceramic insulation and individual fuse protection.

NEW VENTILATION SYSTEM with new fan-housing assembly and permanent, built-in baffling assures highest ventilation efficiency.

NEW, LOW HEIGHT saves space. D.C. terminals are located in same relative position, thus new bussing is not required for re-installation.

All transformers are full-load tested before and after re-manufacturing. It will pay you to investigate the many benefits of the Udylite Project Alert factory conversion program today. For conversion of other old-style Udylite Rectifiers to economical silicon units, contact your local Udylite Representative.

SILICON CONVERSION KITS—Udylite Silicon Diode Kits are also available for UV and UM rectifier conversion right in your plant. A specially fabricated heat sink assembly, complete with diodes and fuses, permits fast, easy installation.

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Udylite Full Automatic Rack Plating Machine photographed on April 4, 1961, at the Chromcraft Corporation. First placed in operation on October 1, 1950. 64' 4" long, 12' 4" wide, with a ceiling height of 15' 1". Racks are 30" x 30" x 60" and tanks are 6' 6" deep, 56" wide.

in ten years!

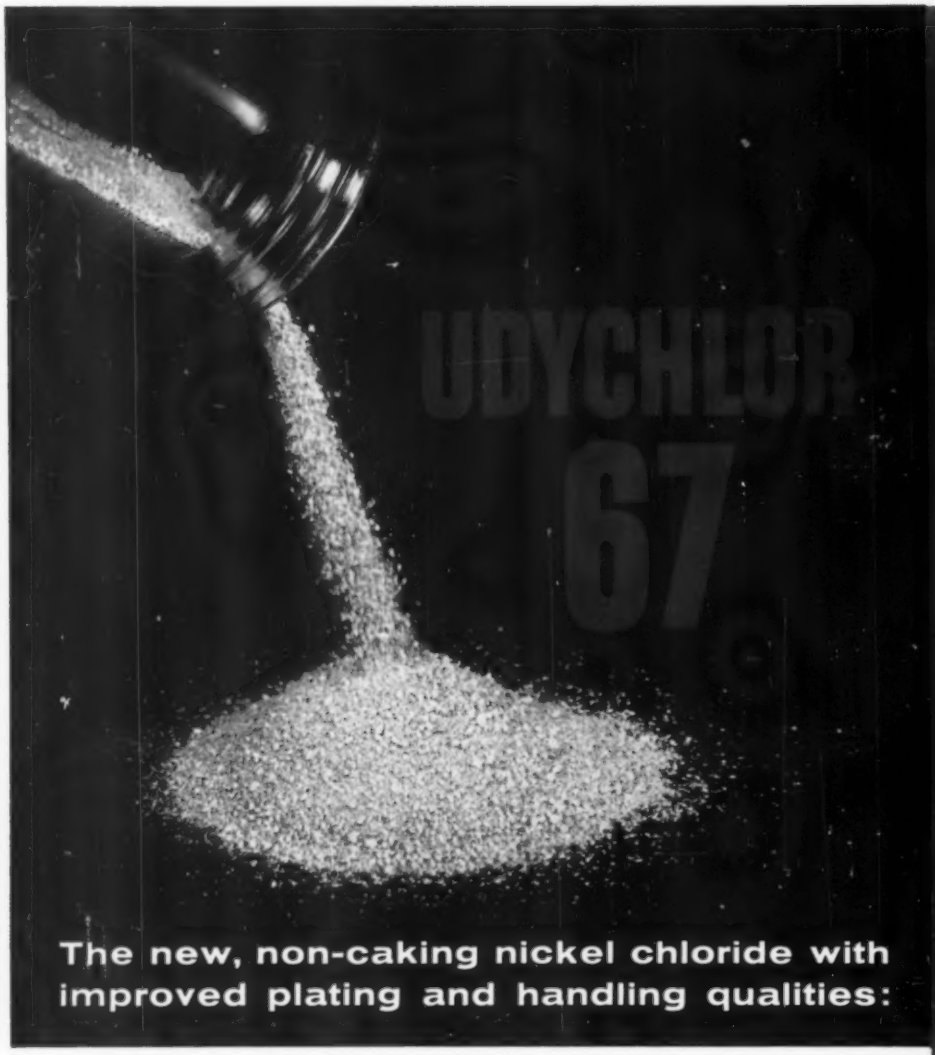
Udylite Full Automatic plates 13 miles of tubing per day for metal furniture leader!

"Our Udylite Full Automatic Rack Plating Machine has more than met extremely heavy production schedules over the last 10-year period—without any significant downtime other than process change-over," states Mr. Irwin C. Keefer, Vice President of the Chromcraft Corporation, St. Louis, Missouri. ■ A leader in the metal furniture industry, Chromcraft Corporation produces more than 500 tables and 3,000 chairs per day. Tubular metal legs and frames are first bright nickel plated in a Udylite Incomparable "66" Process bath. Later they are chrome plated or finished with a gold aniline epoxy coating. ■ "We selected this return-type automatic on the basis of successful past performance of our other Udylite equipment. The need for increased production with uniform high plating quality, ease of operation and reduced maintenance requirements were additional considerations of importance," continues Mr. Keefer. ■ To find out how a Udylite Full Automatic, engineered to meet your specific plating requirements, can improve your production and profit picture, contact your local Udylite Representative, or write:

Udylite

THE UDYLITE CORPORATION
DETROIT 11, MICHIGAN

INDICATE A 1002.



The new, non-caking nickel chloride with improved plating and handling qualities:

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Gives platers 13% more nickel chloride per pound

New Udychlor 67 nickel chloride with less water content offers platers many advantages not found in ordinary nickel chloride:

- **Purity is higher.**
- **Nickel chloride content has been boosted from 54% to 67%.**
- **Udychlor 67 is non-caking; particles are more uniform.**
- **There's less handling and storage.**
- **It features quick-dissolving characteristics.**

What's more, on the basis of nickel chloride content, you pay no more when you specify Udychlor 67! Its many superior plating and handling features are yours at no extra cost. Order Udychlor 67 today!

world's largest plating supplier

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The Udylite Corporation
Detroit 11, Michigan

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CORROSION RESISTANT METALS TOPIC AT NACE NEW YORK SESSION

A symposium on new metals will be a feature of the Northeast Regional Conference of the National Association of Corrosion Engineers in New York, Oct. 30–Nov. 2. A symposium of papers on aluminum's use in corrosion problems will be presented at the NACE South Central Regional Conference and Corrosion Exhibition in Houston, Oct. 24–26.

The following papers are on the New York program: Laboratory Corrosion Tests of Columbium by Donald L. Macleary of E. I. du Pont de Nemours & Co.; Titanium Corrosion in Warm, Moist Chlorine Gas by S. M. Weiman of Titanium Metals Corp.; Corrosion of Beryllium Metal by John R. Steele of the Beryllium Corp. and Application of Zirconium in Chemical Plant Service by John H. Schemel of the Carborundum Metals Co.

Papers to be presented at Houston on aluminum corrosion problems are: Atmospheric Weathering and Marine Service Characteristics of Aluminum Alloys by T. J. Summerson of Kaiser Aluminum and Chemical Corp.; Aluminum Alloys for Chemical and Petro-Chemical Service by R. S. Dalrymple of Reynolds Metals Co. and Aluminum Pipe Lines and Their Cathodic Protection by Ellis D. Verink and M. E. Carlisle of Aluminum Co. of America.

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AMS DETROIT METAL SHOW OCT. 23-27

Visitors to the Detroit Metal Show, October 23–27 in Cobo Hall, will have an opportunity to compare and evaluate the most advanced engineering materials and processes as presented in 275 exhibits and more than 200 technical papers. American Society for Metals, sponsor of the event, has placed emphasis on the educational aspects of the Metal Show.

According to William J. Hilty, exposition manager of the Society, ASM has encouraged its exhibiting companies to staff their exhibits with engineering experts who are able to demonstrate new processes, answer specific technical questions and help solve the visitors individual materials problems.

Visitors will see what each materials group has to offer in specific properties categories, as well as compare all the materials groups for specific properties to meet specific requirements.

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ASTME SEMIANNUAL MEETING IN TORONTO

Bruce Fairgrieve, vice president, Fairgrieve & Son, Ltd., Toronto, has been appointed chairman of the host committee for the American Society of Tool and Manufacturing Engineers 29th Semiannual Meeting in Toronto, October 26–27.

In addition to meetings of the society's officers and directors, three Tech Tours (technical paper presentations combined with plant tours) have been scheduled during the two-day event, which will take place at the Royal York Hotel.

Plant tours will take visitors to Canadian Acme Screw & Gear, Ltd., Canada Cycle and Motor Co., Ltd., Canadian Kodak, Ltd., Massey-Ferguson Mfg. Co., Ltd., and DeHaviland Aircraft of Canada, Ltd.

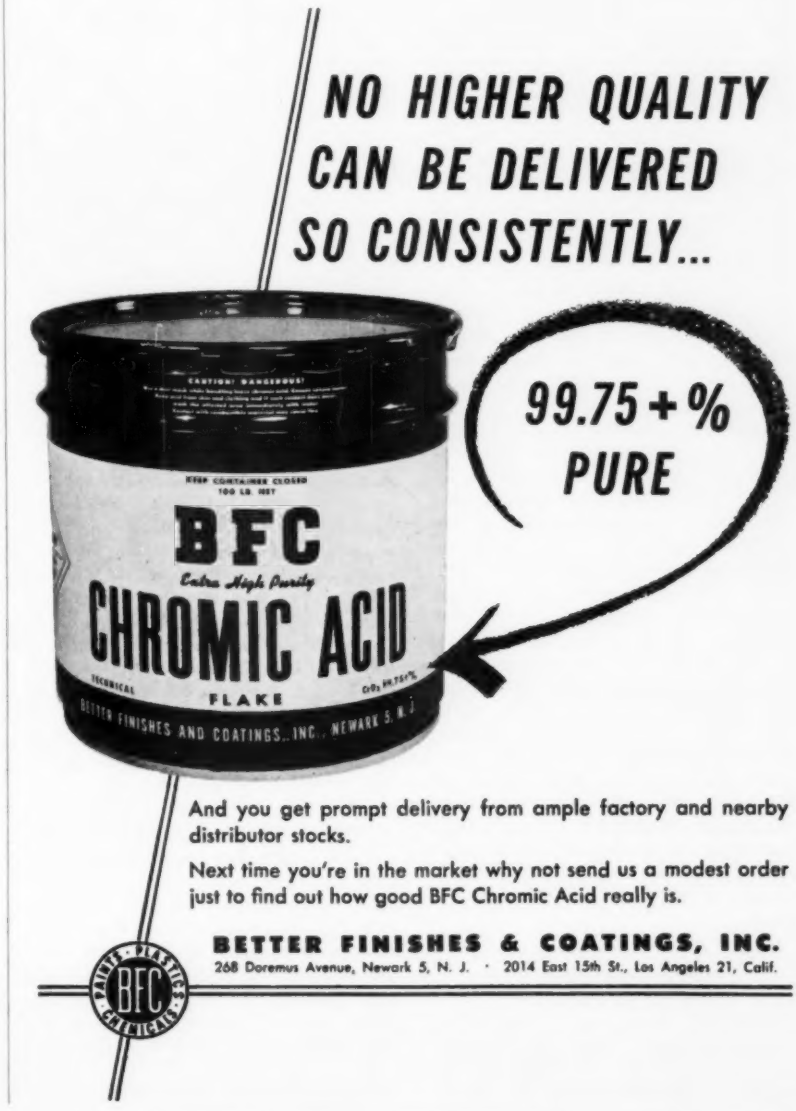
♦

ASTME LIAISON TO AAAS COUNCIL

Appointment of Dr. Harry Osborn, ASTME past president and research director of Tocco Division, Ohio Crankshaft Co., Cleveland, Ohio, as the ASTME representative on the Council of the American Association for the Advancement of Science (AAAS) has been announced by William Moreland, president of the American Society of Tool and Manufacturing Engineers.

ASTME recently affiliated with AAAS, in a move that emphasizes the increasingly close link between science and engineering.

Dr. Osborn, who is a rare combination of scientist and engineer, is an internationally known authority on metallurgical problems, specializing in the development and application of induction heating methods. He received his PhD from Lehigh University in 1937. At Lehigh he served on the faculty of the chemical and metallurgical engineering department, teaching undergraduate and graduate courses and directing research in the graduate school. He has been Director of Research at Tocco Division since 1942.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INDUSTRY NEWS

McCRACKEN HEADS SPECIALTIES DEPARTMENT

Establishment of a chemical specialties department, built around existing product lines for the metalworking and marine industries, has been announced by the Chemical Products Division of Chemetron Corporation.

Nucleus of the new department, according to Howard D. Hartough, division president, is the variety of metalworking compounds produced by the Northwest Chemical Company, a Chemetron subsidiary in Detroit, and the Dunham line of marine combustion catalysts and detergents.

Harold J. McCracken, Northwest Chemical president, was named general manager of the new department.

Products of Northwest Chemical Company, acquired by Chemetron in 1960, include metal cleaners, acid addition agents, phosphate coatings, paint strippers and other chemicals and compounds for conditioning metals before plating, etching, welding, anodizing, priming or painting. The company's plant and offices are at 9310 Roselawn, Detroit.

♦

OLSEN AND BERG ANNOUNCE NEW FILTER FIRM

Announcement of a new firm, Service Filtration Corp., 3443 W. Chicago Ave., Chicago 51, Ill. was made by Raymond Olsen and Jack H. Berg.

The new company will serve as filtration consultants and specialize in the sale of filters for plating as exclusive representatives of the Filterite Corp. of Baltimore, Md. Also included will be pumps and associated equipment, all of which will be offered on a rental basis.

Mr. Olsen was formerly Chicago branch manager of the Commercial Filters Corp. and has served as a sales engineer in the filtration field for the past ten years. He is a member of the local Society of Lubrication Engineers.

Mr. Berg was formerly a sales engineer for Commercial Filters Corp. and has eight years of filtration experience with the Milwaukee, Wis. office and the Moline, Ill. office before coming to Chicago. He is a graduate of Marquette University, College of Business Administration, and a member of the American Electroplaters' Society.

♦

ABBEY FORMS NEW CORPORATION

Harold G. Abbey has announced the formation of a new corporation, the Abbey Automatic Systems, Incorporated, to design and manufacture automatic plating and finishing equipment using his complete series of patents.

The many individual features of "leapfrogging"; individual cell control of all processes which includes time cycling; diversification of operation; modular shipping and erection of components; live ac and dc entrance and exit to tanks; rigidity and mechanical design of components; "Key-Card" dispatching and numerical control of handling and cycling of integrated processes using single cleaning and drying cycle; design assuring no parts but barrel or racks to travel over tanks obviating contamination by lubrication, etc.; ability to "design for the future" should keep equipment from becoming obsolete. All manufacturing and engineering will be carried out on the premises of a building now being made available. In addition to the manufacture of "Abbey-Matic" equipment, Abbey Automation Systems will supply the design and installation of all types of finishing and conveyor equipment including complete plants for plating, polishing and spraying. A complete staff of service and technical engineers will be available for study and counsel.

♦

O'DONOHUE DISTRIBUTORS FOR BRANSON AND PRED DIVISION

O'Donohue Industries, 3818 N. Hubbard Street, Milwaukee, Wisconsin, have been appointed exclusive distributors for Branson Instruments Company, Stamford, Connecticut, manufacturers of ultrasonic cleaning and testing equipment. For the past 15 years O'Donohue Industries has been distributor for Circo Corporation of Clark, New Jersey, manufacturers of metal cleaning equipment who were recently acquired by Branson Instruments.

O'Donohue has also been appointed exclusive distributors for the Pred Division of Binks Manufacturing Company, Chicago, Ill., in the State of Wisconsin and the Upper Peninsula of Michigan. A complete test installation has been installed at O'Donohue's Milwaukee plant for customer product application testing.

♦

HUBBARD-HALL HAS NEW HUNTINGTON, WEST VIRGINIA PLANT

A new nickel anode processing plant, the only facility of its type in the southern area, has been opened by The Hubbard-Hall Chemical Company of Waterbury, Conn. in Huntington, West Virginia. Full scale operations, including cutting, drilling and tapping of Hubbard-Hall rolled carbon nickel anodes are now in progress, with shipments being made throughout the south and midwest.

In addition to its line of nickel anodes, Hubbard-Hall produces and markets a complete range of metal finishing supplies, including metal cleaners, buffing and burnishing compounds.

The Waterbury company also owns a majority interest in Chem-Salts, Inc., a producer of metal salts and other industrial chemicals in Atlanta, Georgia.

According to T. Z. Voyda, manager of Hubbard-Hall's metal finishing department, the new facility will enable Hubbard-Hall to give efficient service to firms operating in the midwest and southern states. All inquiries concerning the Huntington operation should be forwarded to Hubbard-Hall's general offices at Waterbury, Connecticut.

♦

ENGELHARD LICENSEE FOR PLATINIZED TITANIUM ELECTRODES

Four international firms have announced completion of agreements for the production, sale and continued development of platinized titanium electrodes for use in electrochemical processes such as chlorine production and cathodic protection.

Engelhard Industries, Inc. of Newark, N. J., has been named the licensee under United States, Canadian and Mexican patents for the manufacture and sale of the platinized titanium electrodes. This was done under an agreement between Imperial Chemical Industries, Ltd. of England, the Amalgamated Curacao Patent Co. of Curacao and Magneto-Chemie N. V. of Schiedam, Holland, who will cross license under their patents and collaborate on developing additional uses of the electrodes.

Uses for the electrodes include electrolytic manufacture of other chemicals; conversion of sea water and brackish water to fresh drinking water by electrodialysis; cathodic protection against corrosion for steel ships, bridges, other structures, tanks, and chemical equipment; electroplating; hypochlorite generation, electrophoresis; and fuel cell electrodes.

♦

DYNASONICS CORP. IS NEW NAME FOR NARDA

Narda Ultrasonics Corporation has changed its name to Dynasonics Corporation as part of a major change in management's policies towards research and product diversification in the field of electroacoustics.

Dynasonics Corporation was formed in 1957 and is a major producer of ultrasonic cleaning equipment, which provides mass-production ultrasonic cleaning, finishing, metal working and chemical processing. The corporation is located at 200 Michael Drive, Syosset, Long Island, N. Y.

Get brilliant, blue-white zinc plating—without bright dipping!

Du Pont "Zin-O-Lyte"* brighteners give you superior cyanide zinc plating . . . with no bright dipping required. You get brilliant blue-white, rust-resistant deposits directly from the plating bath over a wide range of current densities. Extra rinse and bright dip tanks aren't needed . . . an important space-saving feature.

Two "Zin-O-Lyte" brighteners are available:

- "Zin-O-Lyte"—widely used powder form. Available in two formulations, one for barrel plating and one for still plating.
- "Zin-O-Lyte" Special—a low-cost formulation designed for barrel plating.

For additional information on these products and demonstrations of "Zin-O-Lyte" quality and performance, contact your Du Pont distributor or nearest District Office. Du Pont Electrochemicals Department, Wilmington 98, Delaware.

DU PONT ZIN-O-LYTE®

zinc plating chemicals

*Reg. trademark for DU PONT zinc plating chemicals.

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Protect bright beauty against corrosion with Double-Layer Nickel Plating

Two durable layers of Nickel under a top coat of chromium assure the lasting beauty of this automotive trim.

- **A thick base layer of semi-bright Nickel provides the basis metal with outstanding protection against corrosion—makes eye-catching beauty last.**
- **A heavy coating of bright Nickel furnishes the lustrous base needed to produce the brilliant chrome finish and adds an extra measure of corrosion protection.**

For example: if pitting through the chromium should occur, this troublesome form of corrosion is slowed down at the interface of the two Nickel layers. It then proceeds slowly along this interface, with a greatly reduced rate of vertical penetration.

This is the kind of corrosion protection that preserves the handsome luster of new car trim. With Double-Layer Nickel Plating on bumpers, grilles, lamp bezels, door handles and horn rings—these and other brightwork parts have a durable, matching, mirror-bright finish that satisfies today's *quality-conscious customers.*

For more information on the performance of double-layer Nickel coatings, write for the booklet, *Decorative Plated Coatings of Improved Durability.* A copy is yours for the asking.

The International Nickel Company, Inc.
67 Wall Street INCO **New York 5, N. Y.**

Diagram shows enlarged view of 3-to-1 optimum thickness ratio for Nickel layers in typical Double-Layer Nickel Plating System.

Inco Nickel

Nickel makes plating perform better longer

INDUSTRY NEWS BRIEFS

INDUSTRIAL REPRODUCTION PROCESSES DESCRIBED IN NEW KODAK NEWSLETTER

A newsletter, geared to keep industry abreast of the latest industrial reproduction processes and materials, is now being published by Eastman Kodak Company.

The first edition of "The Kodak Compass" is now ready for distribution. Plans call for publishing the newsletter three to four times a year, and more often if the need arises. It will be available free of charge.

Editorial matter in the newsletter will be concerned chiefly with the "how-to" phase of industrial reproduction, bringing up the latest information on drawing techniques and reproduction processes and materials.

Copies of the newsletter, "The Kodak Compass," are available, from the Sales Service Division, Eastman Kodak Company, Rochester 4, New York.

♦

BATTELLE OFFERS PAMPHLET ON SCIENTISTS AND MANAGEMENT

"Can the Research Scientist Acquire a Management Attitude?" is the title of, and the basic question underlying, a printed discussion now being offered by Battelle Memorial Institute to representatives of industry concerned with research and development. Written by M. R. Nestor, Battelle's manager of project development, the statement is one of a series on the procedures and characteristics of contract research for industry being published by the Columbus, Ohio, research center.

In this statement, Mr. Nestor makes the point that industrial management people and research professionals have much in common, including a high degree of creativeness. Industry's practical needs and the professional's desire for creative freedom are compatible, he asserts.

Case histories are cited in which the research professional's suggestions for work in areas not previously considered are applauded by management men responsible for their company's research and development activities. Such initiative is encouraged, according to Nestor.

The Battelle spokesman reports that the average research professional wants to see the results of his work applied to industrial production and social betterment. For this reason, he acquires a feel for economics and will not recommend proposed research projects, if technological and market factors indicate that the research effort will not fill a real need.

♦

TIN-NICKEL DEPOSIT VS. "WHISKERS" IN TIN INSTITUTE INVESTIGATION

The suggestion is made in issue No. 52 of "Tin and Its Uses" that "metal whiskers" are not likely to grow upon surfaces electroplated with tin-nickel alloy. Trials to establish this point have been in progress for two years at the Tin Research Institute.

YOUR PLATING MAGAZINE QUESTIONNAIRE

So as to assure that PLATING MAGAZINE's classification of its subscribers by number, function and geographical location is constantly and consistently up to date for Audit Bureau of Circulations audit, a Return Sheet was, some time ago, issued to each subscriber internationally. If you are among those relatively few who has not yet accomplished and returned yours, your cooperation in doing so promptly will be appreciated by AES and PLATING.

New Low Prices

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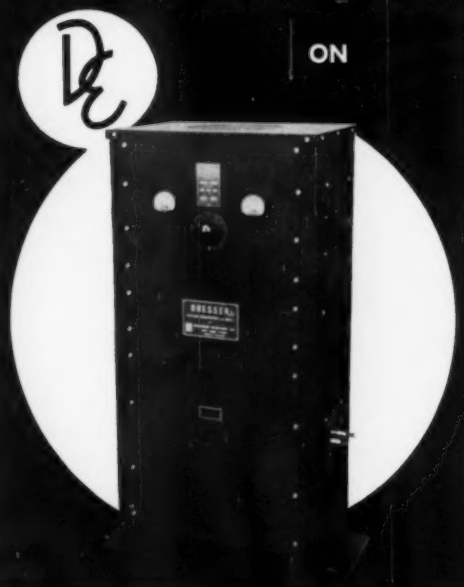

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All standard units incorporate the very latest in Silicon Diode design. Deliver full rated current at rated voltage . . . day in and day out. Continuous manual, integral regulation — full overload protection — low ripple.

Remote control available.

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PATENT ABSTRACTS

DR. D. GARDNER FOULKE
SEL-REX CORPORATION
Nutley, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D.C. Price 25 cents each.

2,978,388, 4/4/61—ELECTROCHEMICAL METHOD—A. Topfer, assignor to Philco Corp., Philadelphia, Pa.

Claim 1 reads: "In a method for bonding two electrically conductive elements, the steps of positioning said two elements adjacent, but spaced from one another in a solution which contains ions of a metal to be plated and which is maintained at a temperature exceeding the melting point of said metal and applying a voltage between said two elements to plate said metal onto one of said elements in an amount sufficient to provide a deposit extending from said one element to the other of said elements."

23 claims.

2,978,389, 4/4/61—TENSIONING THIN MESHES—A. Turnbull, assignor to North American Philips Co., New York 1, New York.

Electroplating a screen with an amount of tensile-stressed metal is described.

4 claims.

♦

2,980,559, 4/18/61—PICKLING MAGNESIUM—L. Whitby, assignor to Dow Chemical Company, Midland, Mich.

A pickle for magnesium alloys consists of 10–40 per cent of glycolic acid and 1/3 to 1/10 as much NO_3 as a soluble nitrate.

4 claims.

♦

2,980,562, 4/18/61—SOLDER FLUX—R. Matter and I. Landon, assignor to General Motors Corporation, Detroit, Mich.

A solder flux consisting of hydrazine monohydrobromide or chlorides along with alcohol and an alcohol soluble polyamide (nylon-type) is claimed.

11 claims.

♦

2,980,593, 4/18/61—TREATING CHROMIUM PLATED CYLINDERS—C. Larson, assignor to Aerodex, Incorporated, Miami, Florida.

A plurality of interconnecting grooves is made on the deposited chromium and a dry lubricant is laid down.

1 claim.

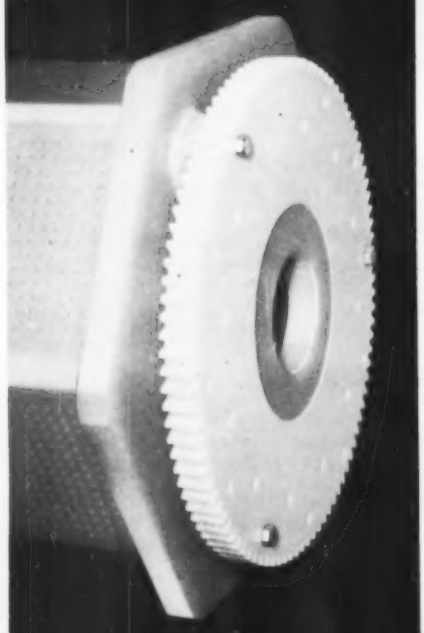
♦

2,980,594, 4/18/61—SEMI-CONDUCTOR DEVICES—J. Pankove, assignor to RCA, Delaware.

An involved dual electroplating procedure for treating p-type semi-conductors is described.

6 claims

LOWER INITIAL COST



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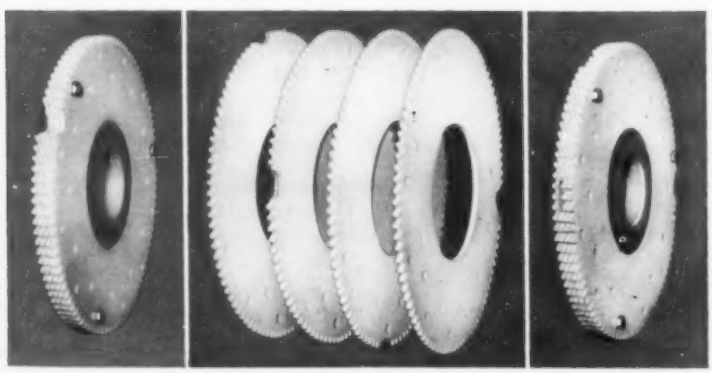

If gear teeth break — disassemble and rotate segments — reassemble gear

Standard models in polypropylene. Other materials upon request. Write for full information.

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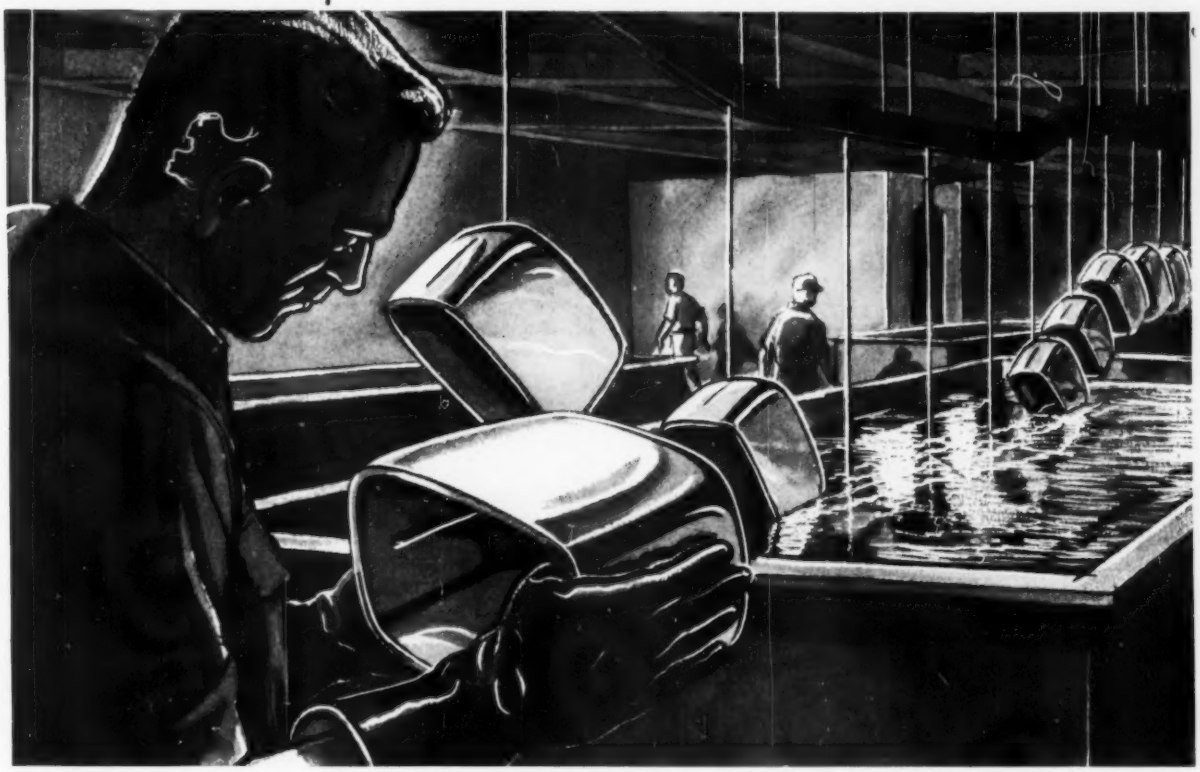
For extra aids in cutting plating rejects . . .

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS



Stop spots, add sparkle to plated parts with Oakite RINSITE® in final rinse

Just a little Oakite Rinsite in the final rinse after plating cuts rejects due to water spotting and staining. How? Rinsite "thins out" the rinse water, makes it drain more quickly, more completely.

While it leaves no drops to cause stains or tarnish . . . it *does* leave a thin, non-oily, invisible film that not only gives plated parts extra sparkle, but also protects against indoor rust.

Rinsite does a remarkable job in cold, hard rinse water. If you do tumbling operations, add Rinsite to the rinse and see how metal parts retain their newly-achieved gleam.

This liquid rinsing aid is just one of a line of Oakite materials to help avoid plating rejects. There are hard-working pre-cleaners . . . precision electro-cleaners for various metals. If you're interested in *results*, ask Oakite. Send today for Bulletin F-9822. Oakite Products, Inc., 40 Rector Street, New York 6, N. Y.

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2,980,595, 4/18/61—NICKEL PLATING—Marilyn Sanicky, assignor to Incar Incorporated, Cleveland, Ohio.

A nickel brightener used with Class I brighteners is described as 0.001 to 0.1 g/l of a totaly hydroxalkylated alkylene polyamine having 3 to 5 nitrogen atoms.

10 claims.

♦

2,980,986, 4/25/61—CUTTER HEAD—Stephen Gryglas, 1874 Fenton Lane, Park Ridge, Ill.

A cutter head for plating racks is described.

9 claims, figure.

♦

2,981,633, 4/25/61—TREATING FERROUS METALS—S. Davis and W. Ray, assignor to Chas. Pfizer and Co., New York, N. Y.

In porcelain enameling ferrous metals the use of glycolic acid (1–20 per cent) prior to nickel plating is described.

5 claims.

♦

2,982,016, 5/2/61—GAS PLATING—F. Drummond, assignor to Union Carbide Corporation, New York, N. Y.

A method of coating a metal body with Al or Mg by subjecting the body to an atmosphere of Al or Mg alkyls at the proper temperature is described.

See also 2,982,017 describing titanium plating magnesium with 3 claims.

3 claims, figure.

♦

2,982,625, 5/2/61—ETCHANT—E. Saubestre, assignor to Sylvania Electric Products, Incorporated, Wilmington, Delaware.

An etchant for copper containing peroxysulfate ions along with chromic and sulfuric acids is described.

11 claims.

♦

2,982,702, 5/2/61—TREATING URANIUM—R. Wehrmann, assignor to Atomic Energy Commission.

Claim 1 reads "a process for pretreating uranium for metal plating, comprising anodically treating a uranium article at a current density of from 60 to 100 amp/ft^2 in an aqueous solution of about 10 per cent polycarboxylic acid from 1 to 5 per cent by weight of glycerine and from 1 to 5 per cent by weight of hydrochloric acid for from 30 seconds to 15 minutes said solution having a temperature of from 20 to 75C."

♦

2,983,360, 5/9/61—CONVEYOR—John Davis, assignor to The Udylite Company, Detroit, Michigan.

A processing machine suitable as a plating conveyor is described.

15 claims, figure.

♦

2,983,634, 5/9/61—CHEMICAL NICKEL PLATING—P. Budininkas, assignor to General American Transportation Company, Chicago, Illinois.

To plate magnesium with electroless nickel first treat with chromic or phosphoric acid, then with fluoride and finally with a pyrophosphate solution. The article can then be immersed in an electroless nickel bath.

35 claims.

♦

2,983,654, 5/9/61—ELECTROCHEMICAL RECORDING—H. Dalton, assignor to Timefax Corporation, New York, New York.

A sheet material sensitive to electrolytic marking by virtue of the presence of a quinoline derivative is claimed.

6 claims.

♦

2,984,592, 5/16/61—PROTECTIVE COATING—J. Logan, assignor to Chem-Metals, Incorporated, Pittsburgh, Pennsylvania.

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

4 good reasons why you should use IRIDITE®

Chromate Conversion Coatings

ON YOUR ZINC OR CADMIUM PRODUCTS

CORROSION PROTECTION

The wide range of Iridite coatings available gives you a choice of corrosion protection—from economical, mild protection of parts for shipment, storage or display, to extremely high protection under exposure to marine and highly humid atmospheres, gasoline or other hydrocarbons.

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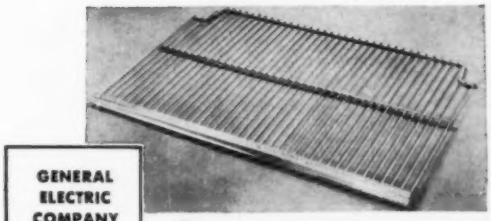
For an extremely tight bond for either baked or air-dried paints, non-porous Iridite blocks moisture penetration—prevents formation of metallic soap products beneath paint coatings.

APPEARANCE

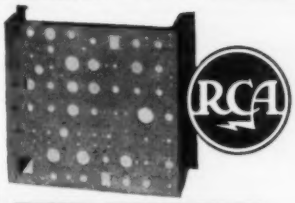
Your choice of colors ranging from clear through yellow iridescent to olive drab. Bright Iridite finishes can also be dyed to provide other color effects.

SPECIAL EFFECTS

Iridite, in combination with other Allied Research processes, can provide a wide variety of finishes. As an example, Iridite 8-P applied to zinc or cadmium, followed by an application of Irilac, gives a highly attractive simulated brass finish.



GENERAL ELECTRIC COMPANY



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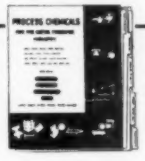

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Chemical and Electrochemical Processes, Anodes, Rectifiers Equipment, and Supplies for Metal Finishing

IRIDITE® Chromates | IRILAC® Coatings | ISOBRITE® Brighteners | ARP® Supplies | WAGNER Equipment

A coating to delay white rust of galvanized steel is laid down on the sheet as it leaves the galvanizing pot by contacting said sheet with a solution of a meta-, ortho-, or pyrophosphate solution (P_2O_5 = 0.2 to 35 per cent).

7 claims.

♦

2,984,595, 5/16/61—PRINTED CIRCUIT MANUFACTURE—K. Schumpelt and A. Korbelak, assignors to Sel-Rex Corporation, Nutley, New Jersey.

The use of a palladium coating on stainless steel prior to plating another metal thereon to effect an easy separation of the plated printed circuit from the stainless steel base.

4 claims.

♦

2,984,603, 5/16/61—PLATINUM PLATING COMPOSITION—R. Duva and E. Rinker, assignors to Sel-Rex Corporation, Nutley, New Jersey.

An electrolyte for plating platinum is prepared by heating platinum diamino dinitrite in solution with phosphoric and sulfuric acids.

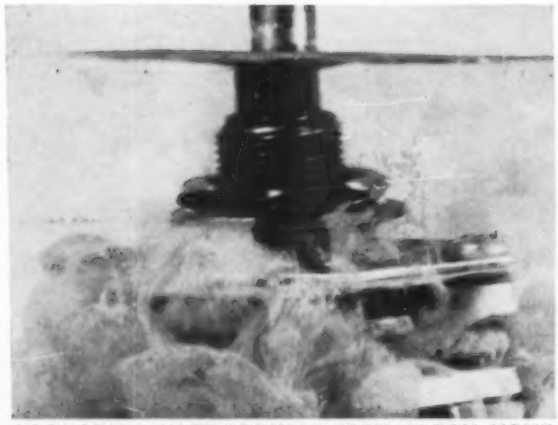
4 claims.

♦

2,984,604, 5/16/61—PLATINUM PLATING COMPOSITION—R. Duva and E. Rinker, assignors to Sel-Rex Corporation, Nutley, New Jersey.

A stress free platinum deposit is claimed results from electrolyzing an aqueous solution containing sufficient sulfamic acid to dissolve at least 6 g/l of platinum "P" salt.

5 claims.



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New Construction for longer Service . . .

STUTZ CONSTRUCTION

Heavy gauge steel with wire woven through steel angle firmly attached to main stem. Cannot come apart or loosen. Side clip is for STUTZ BARREL PLATING TANKS having submerged rectangular anode bars. Side clip not furnished for racked plating tanks unless specified. Standard hook 6 inches. Other hook lengths available, however deliveries could be delayed.

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PRICES—12 cents per inch for basket lengths 18 inches or longer in increments of 3 inches. Side clips 25¢ extra. Shorter containers available at 18" price. Curved containers one size only, 27" for 14" and 16" diameter barrels 15¢ per basket additional.

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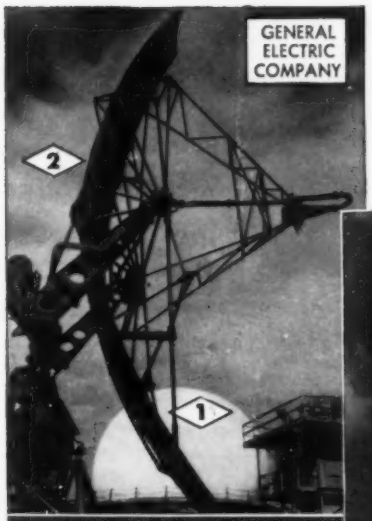

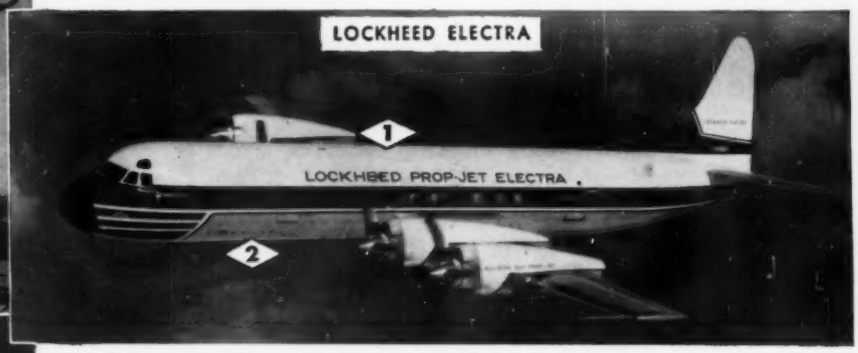

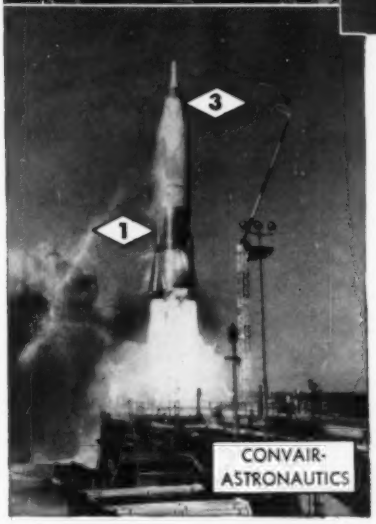

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ON ALUMINUM—needs only normal pre-cleaning. Film withstands cold forming or bending. Easily heliarc welded. Unusually low electrical resistance. Clear, yellow or dye-colored finishees.

ON MAGNESIUM—short immersion, room temperature solution, no electrical equipment. Corrosion protection relatively unaffected by high drying temperatures. Applicable to all alloys. Low electrical resistance. Color ranges from light gray to dark brown.

IRIDITE—a specialized line of chromate conversion coatings for non-ferrous metals. Easily applied at room temperatures with short immersion, manually or with automatic equipment. Forms a thin film which becomes an integral part of the metal. Cannot chip, flake or peel; special equipment, exhaust systems or highly trained personnel not required.

Iridite is approved under government and industrial specifications.

For complete information on Iridite, contact your Allied Field Engineer. He's listed under "Plating Supplies" in the yellow pages. Or, write for FREE TECHNICAL DATA FILES.

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Michner saves a lot of money and a lot of hard work with UNIVERTICAL Ball Anodes in Titanium Baskets

Reports JOE MICHNER,
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Joe Michner is a plater with 42 years of experience. He and Malcolm Smith, Plant Superintendent, inspect Univertical titanium baskets loaded with Univertical nickel ball anodes before they enter the automatic plating machine.

Titanium baskets have been used continuously for two years in plating by one of the largest automotive bumper plants. The ability to maintain constant anode area reduces greatly the possibility of plating out nickel from metal salts. There is no scrap problem, remelt or replacement. "Fringe benefits" include reduction of downtime for replacement of anodes and the fact that floating anode bags are eliminated.

Results like these are common with Univertical nickel ball anodes. Ask Univertical for full details.

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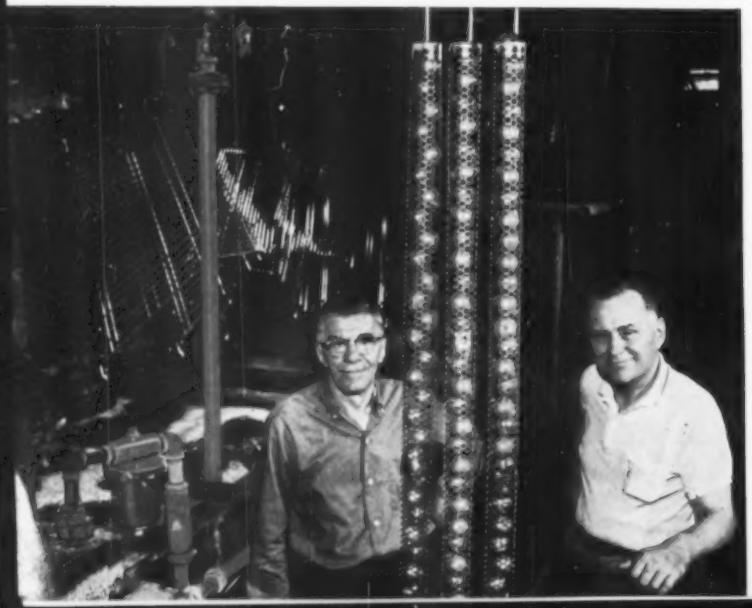

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TRADE LITERATURE

L—1001. STEAM-DETERGENT CLEANING—A concise, up-to-date compilation of modern methods and materials currently used in steam-detergent cleaning is presented in a new, illustrated booklet just released by Oakite Products, Inc.

The booklet, entitled "How To Get The Most Out of Steam Cleaning With Oakite Specialized Detergents," offers tips on steam cleaning in general and lists the six essential properties which all effective detergents used in steam cleaning should have.

L—1002. ALUMINUM COATING—A new method of producing a highly corrosion resistant coating on aluminum is described in Technical Data Sheet No. 87, a three-page usage and instruction sheet prepared by MacDermid Incorporated.

Called MACro Alum No. 5, the product is a dry chromate base salt used in water solution. Coating colors can be varied from brass to bronze, it is claimed, without loss of original brightness. The product produces a chemical conversion of the aluminum surface without changing dimensions. No current or ventilation is required, the product being applied by spray, brush or immersion at room temperature.

L—1003. HEATING AND COOLING COILS—Technical Data Bulletin No. 356, newly published by Dean Products, Inc., contains new information on heating, cooling, and heat transfer, an instantaneous LMTD chart, how to figure heating load, how to select heating surface, pressure drop short cuts, etc.

L—1004. IRON PHOSPHATING COMPOUNDS—A new 4-page Interlox brochure has been released by Northwest Chemical Co. It describes iron phosphating compounds and provides technical helps in the operation of a phosphating line.

L—1005. METAL FINISHING AND PLATING CHECK LIST—A new six-page brochure describing their diversified line of metal finishing processes, plating chemicals, and equipment has been published by Enthone, Inc.

"Chemical Products and Processes for Metal Finishing from Enthonics" introduces new product lines for steam cleaning and chemical plating. Additionally, it briefly describes the many other Enthone products for finishing of aluminum, blackening and coloring of metals, rust and scale removal, metal stripping, inhibiting of rust and tarnish, stripping of organic finishes, and metal cleaning and degreasing.

L—1006. PLATING SOLUTION ANALYSIS—Quick, accurate analysis of acid gold alloy plating solutions obtained by polarographic methods are described in a 3-page paper by Dr. Karl Schumpelt and Arnold H. Craft of Sel-Rex Corporation and is available free of charge.

Originally presented to the American Electroplaters' Society, Newark Branch, and published in PLATING MAGAZINE, this paper has been reprinted as a technical service.

The authors describe in detail the development of a polarographic method for testing and evaluating acid gold alloy electrodeposits, giving graphs, formulas, and specific examples. Their paper also gives a table comparing results of polarographic and standard analytical methods, and lists notes for further reference.

L—1007. ELECTROCLEANER—Released by Wyandotte Chemicals' J. B. Ford Division is a new bulletin, F-6550, on Wyandotte Lectrite NF, electrocleaner for brass and sensitive metals.

Covered in the bulletin is the use of Lectrite NF at varied concentrations and temperature ranges for electrocleaning brass, zinc die castings, lead-base alloys, nickel-silver, and other special alloys.

Featured in the bulletin, is the use of Lectrite NF in automatic plating machines where long transfer times can cause staining or etching of buffed surfaces.

L—1008. TRICHLORETHYLENE DEGREASING EQUIPMENT—The Uddeholm Co. of America, Inc. has released a new 4-color, 16-page booklet describing their trichlorethylene and degreasing equipment.

The correct selection of the vapor, spray or immersion methods of degreasing are discussed in relation to various applications. Photographs show several types of standard design and custom-built degreasing units.

L—1009. PICKLING SALTS—Enth-Acid 97, claimed to be an inexpensive nonfuming pickling solution for copper, brass, aluminum and many other non-ferrous metals has been developed by Enthone, Inc., subsidiary of American Smelting and Refining Company. It is said to be a safe and economical powdered replacement for hazardous nitric and sulfuric acids.

According to the company, Enth-Acid 97 effectively removes heat treat scale and oxides, including red cuprous oxide from copper alloys, and copper smut from aluminum alloys. It has proven advantageous prior to electroplating to activate difficult-to-plate alloys, such as beryllium copper, leaded brass, phosphor bronze, and tin-lead solders with a minimum loss of metal.

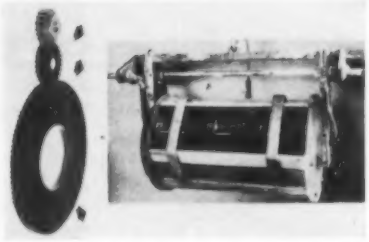
L—1010. CHEMICAL EQUIPMENT—The wide range of specially engineered equipment it makes for the chemical process industries is briefly described in a new 4-page bulletin from Industrial Filter & Pump Mfg. Co. Called GEN 61, the brochure describes and illustrates such items as pressure filters, ion exchangers, demineralizers, water softeners, centrifugal pumps, heat exchangers and waste treatment systems.

L—1011. BUFFING AND POLISHING—A new 20-page technical manual covering the manual or semi-automatic polishing, burring, satin finishing, buffing and high coloring of metals, plastics, wood and organic coatings on wood has been made available by the Lea Manufacturing Co. Data includes finish selection, finish appearance and characteristics and the various production factors affecting different surface finishes. Also included are general application tables for various types of abrasive compositions.

L—1012. VACUUM METALIZING—A new and comprehensive brochure Bulletin 584 on vacuum metalizing has just been published by F. J. Stokes Corp. Its advantages are set forth, a large number of current applications are illustrated, suggestions on lacquering and filament arrangement are given, as well as complete specifications for the latest designs of Stokes vacuum metalizing equipment. These include units with 24-, 36-, 48-, and 72-in. diameter chambers, as well as special custom-designed systems.

L—1013. ELECTRONIC INFORMATION SEARCHING—Free, 8-page brochure describes American Society for Metals' new electronic system of searching technical articles, documents and patents on metals and related subjects. It discusses the mechanized way to reduce research costs and shows how subscribers may receive, every two weeks, information on anything published during the preceding two weeks on their field of interest.

EQUIPMENT AND SUPPLIES



E—1001. PLATING BARREL GEAR-DRIVE—A universal application gear-drive is the new Singleton "Seilon" gear-drive developed and manufactured by The Singleton Co.

According to the announcement, the new gears are available in models to fit all barrel equipment—any make, type, size, age; and are entirely inert to all solutions (acid, alkali) to 220F.

Seilon's characteristics are said to feature impact and structural strength (shatter-proof and stress-resistance), resilience (tough, long-wearing), self-lubricating (smooth operating), machineable (cut in all standard diametral pitches—20° or or 14½° pressure angles).

E—1002. CLEANER-PHOSPHATIZER—Magnus Chemical Company, specialists in industrial cleaners and cleaning equipment, has announced production of Bondtite (82-X3), a new compound for use in spray washing machines, that eliminates *p*H control problems, keeps spray nozzles clean and combines in one action the cleaning and positive phosphatizing stages that once required two individual operations. The phosphate coating is said to provide better paint adhesion, more even coverage and consequently, fewer rejects.

The *p*H control problems of ordinary phosphatizers are eliminated because Bondtite maintains a constant *p*H of about 5 in any practical concentration strength. This, in effect, ends the necessity for extensive *p*H testing and addition of compensating materials. The prime concern becomes the solution strength, and this is determined by a simple 60-second test.

Ferrous and non-ferrous metals are thoroughly cleaned of light soils with non-foaming, fast action. Simultaneously, Bondtite provides a uniform, optimum phosphate coating for positive paint adhesion and coverage.

E—1003. PORTABLE pH METER—New Electrion II line-operated portable *p*H meter features a ± 500 millivolt scale and a unique, full-range shock-resistant combination electrode, according to the manufacturer, Sel-Rex Instruments Division, The Meaker Co.

The Electrion II potentiometric model *p*H meter reportedly has the same high stability, and gives the same precise, reproducible readings (with standardization once-a-week or less), as the Electrion I.

MANHATTAN RUBBER LINING PROTECTS COSTLY PICKLING AND PLATING EQUIPMENT ...Permanently

STOP CORROSION STOP CONTAMINATION

Photo courtesy Hanson-Van Winkle-Munning Co.

- THICK, MULTIPLE CALENDERED SHEETS
- INSEPARABLE RUBBER-TO-METAL BONDS
- ELIMINATE DANGEROUS "STRAY CURRENTS"
- NATURAL OR SYNTHETIC RUBBER
- WON'T HARDEN, CRACK OR OXIDIZE
- TESTED UNDER HIGH VOLTAGE

Be *certain* of lifetime protection for your costly equipment and protection against contamination of expensive plating baths. Specify Manhattan lining on your next tank lining job.

MANY MANHATTAN LINED TANKS HAVE BEEN IN CONTINUOUS USE OVER 30 YEARS!

ENGINEERED RUBBER PRODUCTS .. MORE USE PER DOLLAR

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RM1039-R

Standard features include: constant-reading meter; amplifier-stabilized, drift-free indicator needle; reference pointer; easily connected solid ground (usually found only on larger, more expensive units); fast-response tubes said to require no "breaking-in" time; 115v line operation (leave in continuous service to eliminate warm-up time, give instant reference and constant *p*H readings).

E—1004. SELF-PRIMING FILTER SYSTEMS—New plastic materials with chemical, mechanical and heat resistance now make it possible to filter extremely corrosive, expensive and sensitive liquids with no loss of solution and without metal contamination, according to claims of the manufacturer.

Utilizing lucite, epoxy, teflon, neoprene, hypalon and kel-f components for the pump and filter chamber as required, Sethco Mfg. Corp. has introduced a new series of self-priming "all-plastic" filter systems that provide crystal clear depth filtration for many problem industrial liquids.

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If desired, you can, at nominal cost, order a quantity of reprints of any published PLATING technical article. Minimum order is 100 copies. Ask for further, fuller purchase details, including cost. In this connection, write or call Thomas W. Lowe, Production Manager, PLATING MAGAZINE, American Building, 443-445 Broad Street, Newark 2, N. J.

E—1005. SURFACE MEASUREMENT INSTRUMENT—A new portable, transistorized, battery-powered instrument for measuring surface finishes on metals, plastics, ceramics and organic materials has been added to the line of Brush Surfindicators. Designated Model MS 1000 Surfindicator, the new unit is available from Brush Instruments division of Clevite Corp.

Precision measurements from one to 1000 microinches can be made at any point in a production line or inspection area with the 5½-pound unit.

E—1006. ALUMINUM CHEMICAL POLISHER—A single solution of bath ingredients (supplied in one package) is claimed to replenish the bath from time to time. This new control method, said to take but about 2 or 3 minutes and which may be checked by a routine non-technical worker, in an automatic or manually operated bath is announced by Technical Processes Division of Colonial Alloys Co.

E—1007. ANTI-TARNISH COMPOUND—Tarnishing of brass, copper and silver, as well as plated deposits of these same metals is said to be eliminated by the use of Clepo 170 anti-tarnish compound. A short immersion in the Clepo 170 solution will provide a colorless film claimed to resist the attack of oxygen and sulfur compounds for periods ranging from 6 to 12 months, depending upon the local atmospheric conditions. Spotting out is similarly eliminated and lacquer coatings will have improved adhesion when applied after treatment in the anti-tarnish compound. This process is inexpensive to operate and requires no special tank linings according to the Frederick Gumm Chemical Co., Inc.

New Model D

WINSCOTT

(The Original In-Tank)

FILTER

for $195.00 and no extras

Superior Characteristics and Operating Dependability at Lowest Cost

NEW Temperature Tolerances . . . well above operating limits of all plating baths (160° +)

NEW Corrosion Resistance . . . withstands all acid and alkaline type baths including high chloride nickel baths

NEW Higher Flow Rates . . . up to 360 gal./hr. with clean baths

NEW Cartridge Filtration . . . for easier, faster economical changes where extremely minute particle size is not critical. (Other Winscott models employ filter bags with or without filtering media.)

NEW Shallow Solution Levels . . . for precious metals. As low as 3 inches now possible with bottom intake design. Keeps sludge out of tanks.

Compare Features and You'll Choose WINSCOTT — First and Still Best In-Tank Filter Available

Fully Enclosed, Continuous Duty, Induction Type Motor is *STANDARD* on the *WINSCOTT*. No brushes to wear out and drop contaminating particles into the tank. No need to shut down the filter as with intermittent types. Efficient 3450 r.p.m. speed operates quietly without irritating whine of higher speed motors. Powerful ⅓ h.p. capacity of the Winscott guarantees against overloading at maximum flow rates.

Write for details and name of your nearest distributor.

The Chemical Corporation

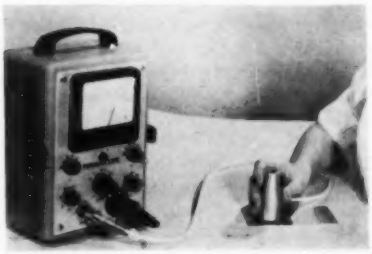
57 Waltham Avenue, Springfield 9, Mass.

E—1008. ROTARY DRUM MACHINE—Designed especially for use in mass production in the plating industry, a small (occupies 3 by 6 ft floor space) rotary drum type drying machine has been produced by The Alvey-Ferguson Co. for handling miscellaneous small parts in bulk form after plating. Provided with a 24 in. diameter drum, it is gas heated and recirculates hot air for economy. Fire box, heating and blower assemblies are located under the drum. Machine is completely assembled and wired and ready for connection to services.

E—1009. ULTRASONIC GENERATOR—Westinghouse Electric Corp. has developed a new solid state 2-kw, and also a 3-kw generator for its expanding line of ultrasonic cleaning equipment.

Housed in a roll-around cabinet, the new units with their compact design take up less space, require fewer components, and are said to offer more reliability.

The new units are claimed to be the lightest generators in the industry, weighing between 20 and 40 lb. The line now includes units rated at 125, 250, 500, 750, 1000, 2000 and 3000 watts.



E—1010. COATING GAGE—A new, non-destructive testing device has been developed by Twin City Testing Corp. at the request of Alcoa Research Laboratories for accurate gaging of non-conductive coatings on aluminum and its alloys. The new instrument is being marketed to industry as a Type EC Permascope by Twin City.

In addition to gaging non-conductive coatings on non-ferrous base metals (such as aluminum and copper), the Type EC Permascope offers a non-destructive means of measuring: (1) the thickness of a non-ferrous metal on a non-ferrous base, (2) the thickness of a non-ferrous coating on a non-conductor, and (3) conductivity of a non-ferrous metal.

E—1011. ALKALINE SOLVENT—An alkaline solvent which, in one operation, is claimed to remove rust, paint, oil, grease, and shop soil from metals has been

for long-lasting plating **TRIANGLE BRAND**
COPPER SULFATE
NICKEL SULFATE

TRIANGLE BRAND Copper and Nickel Sulfates help give you the hardness you need for long lasting plating. They have purity, uniformity, solubility and high conductivity. This all around dependability *does* make a difference. Therefore we suggest that you specify Triangle Brand Copper Sulfate and Triangle Brand Nickel Sulfate for all of your plating work. Send today for the free booklet "The Use of Copper Sulfate for Copper Plating."

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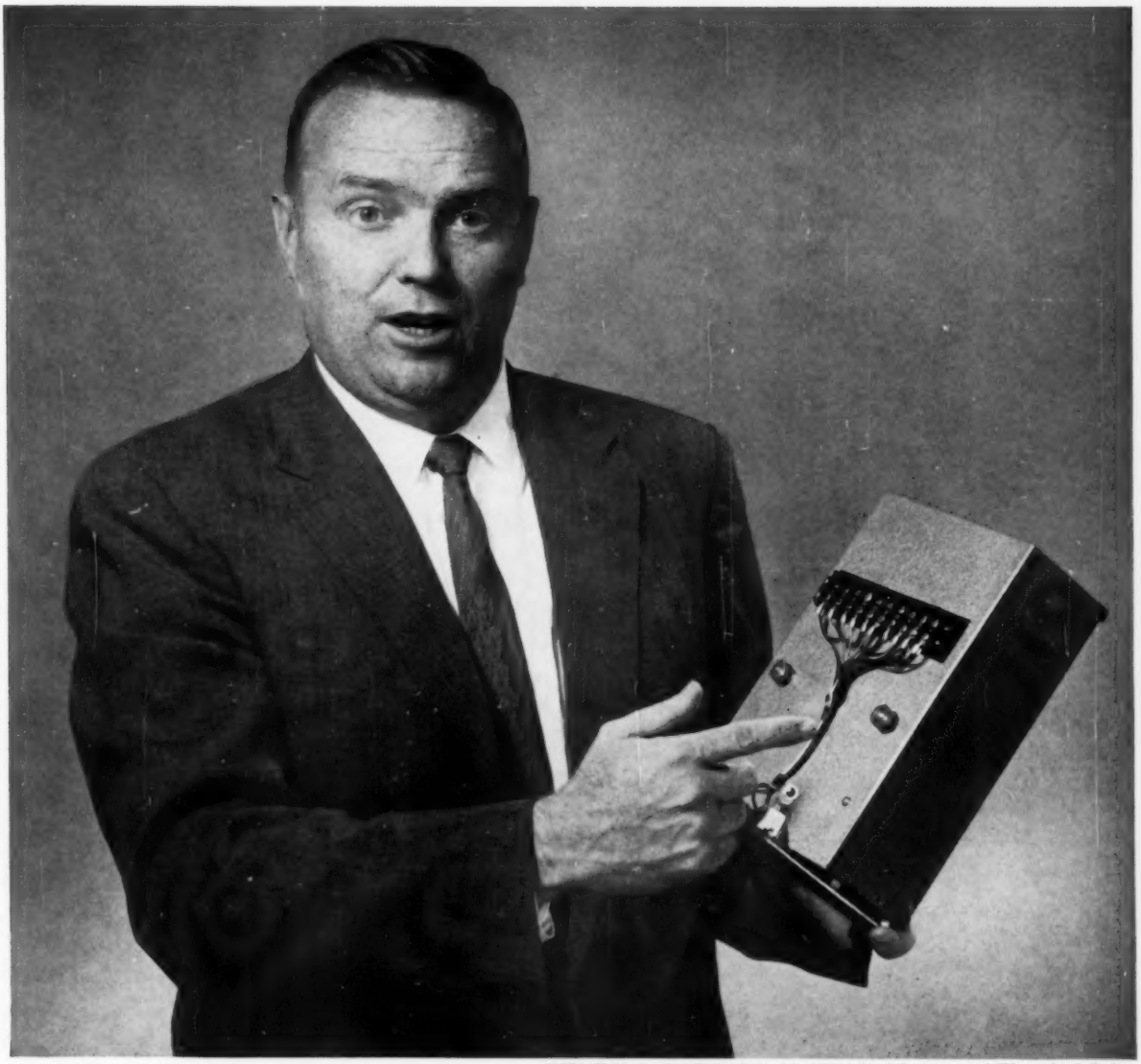
The AES member's handsome sterling silver lapel button can be purchased from your Branch Secretary at $1.38 per button including tax. These, in turn, can be purchased by Branch Secretaries from National Headquarters at that amount. The silver Branch Past President's button can be purchased by Branch Secretaries from the National Office at $1.43 per button including tax.

For cleaning these sterling silver buttons, here is one expert member's reported method, "Place hot water in which a little washing soda has been dissolved into an aluminum pan or any container with a small piece of aluminum at bottom (concentration: one tablespoonful of soda to one quart of water). Immerse the button so as to touch aluminum, and allow to soak until tarnish disappears. Operation will clean but will not injure the silver."



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Less Downtime, Fewer Rejects. Automatic current limiting is standard, not an extra. Unit won't shut down on normal overloads and shorts.

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AVS or ACC. (automatic voltage stabilization, automatic current control) . . . with current limiting . . . are both available at flick of selector switch.

Also yours with this new package control: the advantages of smaller size, less weight, no moving parts. *And the price is hundreds less than you'd pay for the same features in separate rectifier units of conventional design.*

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developed by Enthone, Inc. Known as Endox® L-76, it is a non-flammable liquid combination of solvents, chelating agents, and strong alkalis for the removal of rust, oil, grease and paint.

It can be used for soak cleaning of oily, smutty, rusty steel prior to phosphating, blackening or painting. It can also be used for cleaning copper and brass and is said to remove tarnish in addition to soil, remove some heat scales from copper, and loosen other types of scales sufficiently so that subsequent acid pickling is considerably shortened.

E—1012. TUMBLING COMPOUND—A heavy, fast cutting abrasive tumbling compound is now available from Frederick Gumm Chemical Co.

CLEPO 205-W is claimed to effectively cut even the toughest metals such as carballoy, as well as extremely hard surface scales. It is said not to break down in a matter of several hours, but will maintain its sharp cutting properties for periods up to 30 hours without recharging with additional compound.

E—1013. BENCH RECTIFIERS—A new bench rectifier line has been announced by Hanson-Van Winkle-Munning Co.

The line is designed to provide maximum power in a minimum space, according

to Henry B. Koehler, shown in picture, manager of electrical sales. The rectifiers' one-piece cabinet shell comes off easily, making all internal parts easily accessible. The unit has only five parts, making the new line both economical and easy to maintain.

The rectifiers are applicable to laboratory use, small plating installations and specialized battery charging.

The ratings of the new units range from 150 amp at 24 v down to 25 amp at 6 v. All units are equipped with large scale ammeter and voltmeter for quick meter readings.

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You're a winner every time with Permag. All sizes, all shapes, all grades — stocked for 24-hour delivery. Also magnets engineered and fabricated to your needs.

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paint spraying and coating

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TUNGSTEN CARBIDE valve seat and needle
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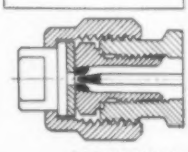
for efficient, trouble-free performance

Here's the gun designed in detail for better, trouble-free performance. Needle cleans seat orifice automatically. For use at pressures from 400 to 2,000 psi. Complete choice of interchangeable orifice tips in all spray patterns, capacities and materials.



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new improved

GREASELESS COMPOUND

in new lightning Aluminum tear opening top

* For Buffing, Burring, Polishing of Metals, Wood, Plastics.
* Bison New Improved, laboratory controlled, Greaseless Compounds work faster, are more economical, give uniform, cleaner, and higher quality finishes.
* Bison Greaseless compounds are available in any grit size required for butler, brushed, satin finishes and heavy-duty cutting operations. Are packaged in foil-lined tear top fibreboard containers as well as standard Aluminum tubes.

Write for samples. Jobbers inquiries invited.

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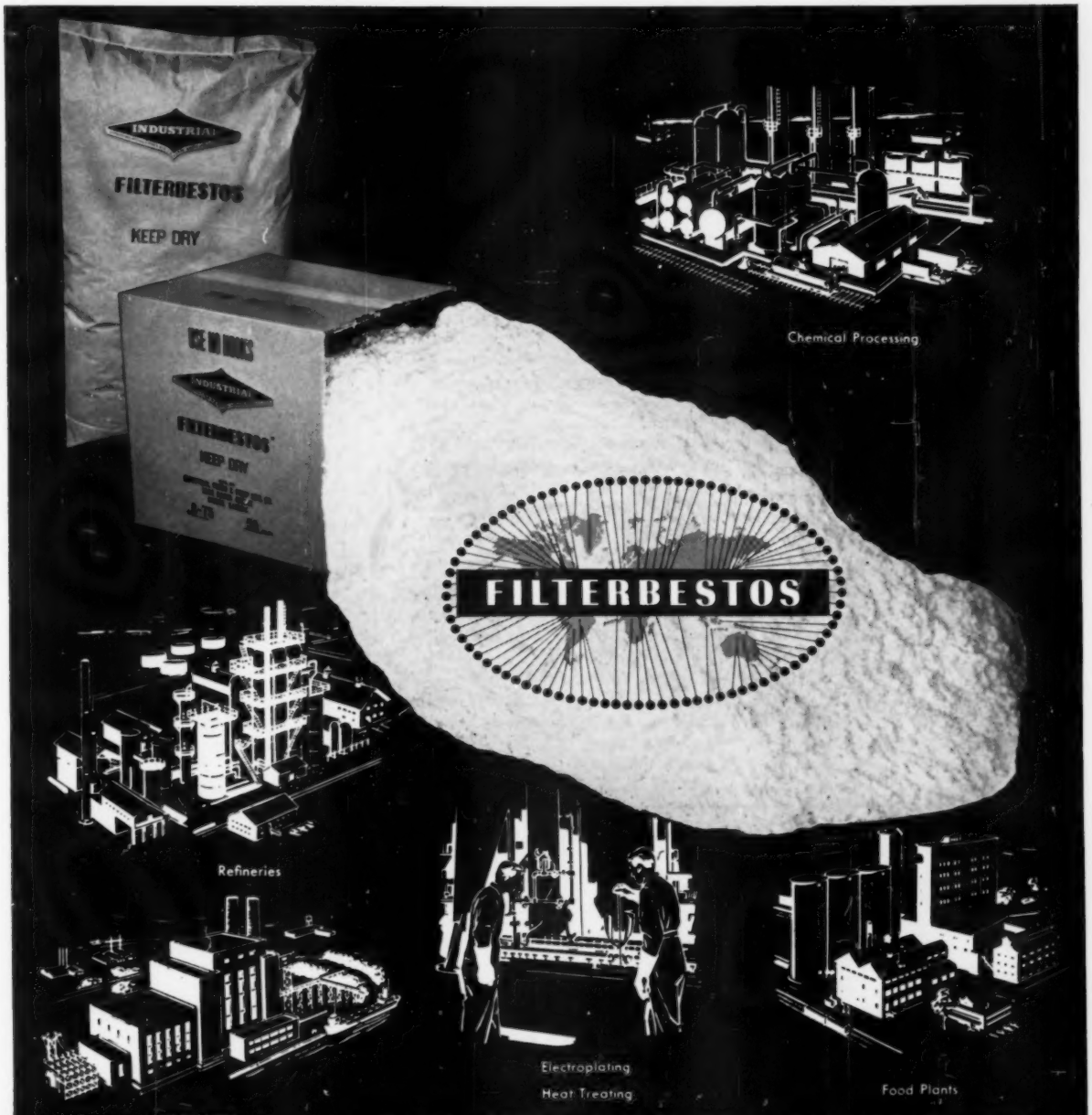

There can be little doubt of the superiority of design and manufacture of INDUSTRIAL's Filtration equipment — but did you realize that INDUSTRIAL also manufactures a superior family of filter aids under the trade name of FILTERBESTOS?*

Over a third of a century of carefully catalogued experience is crammed in every package. INDUSTRIAL produces over a dozen grades of only the highest quality filter aids, each tailored for a specific family of uses. Yet, because of high manufacturing efficiency and product quality — FILTERBESTOS is actually LESS expensive to use.

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PERSONALS

R. A. Miller

G. Chaplenko

ROBERT A. MILLER has received appointment as sales manager for specialty plastic films being introduced by Allied Chemical's General Chemical Division.

With the division 15 years, Mr. Miller was manager of its New York Metropolitan sales office for the past three years, having earlier served in heavy chemical sales at General's New York headquarters. He was also assistant manager, and earlier, a salesman for General's Baker & Adamson line. Mr. Miller holds a BA degree in chemistry from Princeton University.

GEORGE CHAPLENKO has been promoted from chemist in charge of the chemical section to assistant department manager of the Chemical Metallurgical Laboratory of Singer Manufacturing Co., Elizabethport, N. J. Prior to joining Singer six years ago, he was with Hayden Chemical Corp., Fords, N. J. Electroplating, corrosion protection, metals and alloys used by the plant, and organic finishing are under his supervision. Recently awarded his Master's degree in chemical engineering at the Newark College of Engineering, Mr. Chaplenko is a member of the American Electroplaters' Society, Newark Branch and the American Chemical Society.

♦

A. JOHN CORNISH JR. and **JAMES L. DICKENS** have been appointed sales engineers as part of the expansion of the sales force of Enthone, Inc., subsidiary o American Smelting and Refining Co. Mr. Cornish will represent Enthone in the Eastern Pennsylvania, Maryland and Delaware area and Mr. Dickens will handle the Buffalo, N. Y. district.

A. J. Cornish Jr.

J. L. Dickens

Mr. Cornish is a graduate of Lehigh University. Most recently he has been employed as plant manager of Quality Plating Company of Chicago. Additionally, he spent many years supervising plating installations for Westinghouse. He is a member of the American Electroplaters' Society.

Mr. Dickens attended Cornell University and, prior to joining Enthone, was employed by Allied Chemical Corp., Solvay Process Division. For the past one and one-half years he has been a technical service engineer in the Enthonics Laboratory.

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ZINC PLATING PRODUCTS

ROHCO 100 and ROHCO 102: Barrel zinc brighteners for brilliant, blue-white deposits.

Econobrite: Economical, bright deposits, suitable for post-plating dip.

Perma-Brites: Uniform, commercial finishes at lowest cost.

ROHCO 503: Most popular zinc brightener in plating.

ROHCO Zinc Purifier: Purges zinc plating baths — saves brightener.

ROHCO Zinc Sol: Add water for instant zinc plating bath.

ROHCO ZW-600: Wetting agent for more efficient, cleaner zinc plating.

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Rodips CD-3, CD-4, CZ-10, and Roblack for cadmium: Superior post-plating treatments for passivating and coloring cadmium plate.

Rodips ZN-22, ZN-23, ZN-25, ZN-30, etc., for zinc: Superior post-plating treatments for passivating and coloring zinc plate.

Rodip AL-50 for aluminum: Superior chromate treatment imparts corrosion protection to aluminum and its alloys.

OTHER ROHCO PRODUCTS

ROHCO Super No-Cro-Mist and ROHCO Anti-Spray: Spray suppressants for chromium plating baths.

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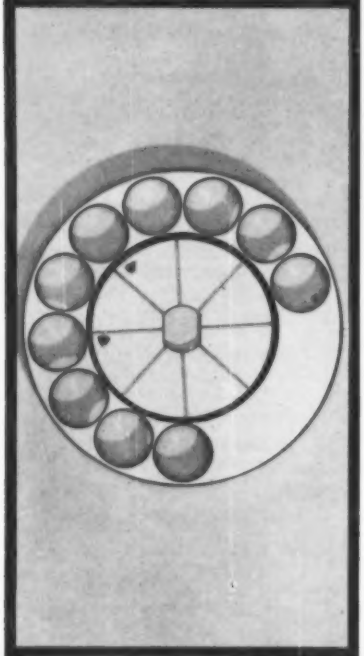

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■ To cut and color buff prior to chrome plate at minimum production speeds of 700 finished dials per hour... potential capability of 1,000 dials per hour to be available to meet future needs... finish to be free of imperfections despite irregular surface and thin edges... fixturing to be simple and maintenance-free.

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For The Process see opposite page.

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WILLIAM T. WALLING, formerly a field electrochemist with H-VW-M in the Chicago area, has rejoined the company in the same capacity and in the same territory. Mr. Walling replaces **DONALD H. MORRIS** who has been promoted to district manager in the Chicago area.

Mr. Walling first joined H-VW-M in 1952 as a junior chemist in the Matawan Laboratories. In 1954 he transferred to

W. T. Walling

D. H. Morris

Chicago as a field electrochemist. Three years later he transferred to the Grand Rapids office. He resigned early in 1960 to join a large automotive parts plater in the midwest.

Mr. Walling is a Seton Hall graduate with a degree in chemistry. He is a member of the American Electroplaters' Society.

♦

DONALD H. MORRIS has been appointed Chicago district manager by Hanson-Van Winkle-Munning Company. In his new assignment, he is in charge of company sales in 17 states. Mr. Morris takes the place of **RALPH R. GRANQUIST** who recently retired.

Mr. Morris joined the company in 1955 as a field electrochemist. After spending a month's training period in the home office laboratories, he moved to the Chicago district.

Mr. Morris is a 1941 graduate of Colgate University. He holds an AB in chemistry. Upon graduation he worked as a chemical engineer for a large New York manufacturer. In 1943 he entered the Marine corps and served until the end of the War in the Pacific Theatre.

Prior to joining H-VW-M, Mr. Morris worked as a process engineer for a large automotive parts processing company. He is a member of the Chicago Branch of the American Electroplaters' Society.

♦

JAMES T. LANG has been appointed general manager of Industrial Hard Chrome Plating Corp., Industrial Kanigen Corp., and Industrial Hard Chrome Plating Co., of California.

Also announced at the same time was the appointment of **JOHN W. BABCOCK** as general sales manager.

Two of the plants are specialists in hard chrome plating with grinding and honing facilities. The third plant operates under a license from G. A. T. X. for deposition of electroless nickel.

Prior to joining the staff of Industrial Hard Chrome Plating Corp., Mr. Lang was associated with the Richfield Oil

EXTENDED OPPORTUNITY TO AUTHORS INTERESTED IN MILWAUKEE CONVENTION PARTICIPATION

So as to implement the emphasis that is being placed by the AES Editorial Board in creating an educational program for the AES's Annual Convention to occur in Milwaukee, Wisconsin, June 24–28, 1962 that will be so significant and appealing that few persons seriously interested in educational enrichment in electroplating, metal finishing, organic coating and other such subjects can afford to miss it, the Board has extended to December 1, 1961, the deadline date for receiving authors' expression of definite desire to participate in that program.

Consequently, AES member or non-member authors of original, unpublished technical and scientific papers on electroplating, metal finishing, organic coating and allied arts wishing to be considered as prospective participants in that Milwaukee educational program are cordially invited to communicate promptly either with Host Branch Educational Chairman Joseph Andrus direct (Address: 62-01 Howard Street, Chicago 48, Illinois) or through the Editor of PLATING MAGAZINE, 443–445 Broad Street, Newark 2, New Jersey.

Particularly desired for consideration are proposed original technical papers on the subjects of mechanical finishing, organic coating, pickling, and etching of aluminum for finishing purposes.

You are therefore urged to record your availability with Mr. Andrus forthwith. In doing so, it is mandatory that you specifically state your subject and that you send both a FIRST ROUGH DRAFT of your manuscript and an abstract thereof.

Corp. He graduated from the University of California, Berkeley, with a BS degree, in the class of 1940.

Mr. Babcock is a graduate of the University of California at Berkeley.

♦

ROBERT J. RACINE has been appointed national sales manager of Kelite Corp. Mr. Racine is a chemical engineering graduate of Michigan College of Mining and Technology. He came to Kelite as Western Regional sales manager in 1956. In his new position, he will be in overall charge of sales activities in the U. S.

R. J. Racine

C. G. Borlet

CHESTER G. BORLET has been appointed plating products specialist for the Plating Division of Metal & Thermit Corporation. In his new capacity, Mr. Borlet will devote his efforts to the marketing of M&T's nickel, chromium and copper electroplating chemicals, anodes, proprietary plating compounds and processes in the Detroit area. He is located at 1700 East Nine Mile Rd., Detroit 20, Mich.

Until recently Mr. Borlet was technical director of Grand Rapids Brass Company, Grand Rapids, Mich. He is a 1935 graduate of Kent State University, Kent, O., and has pursued further studies at both Western Reserve University in Ohio and at the University of Detroit.

His career in the electroplating industry included service as a sales engineer, and then superintendent of New York-Ohio Chemical Company, followed by a position as manager of sales service with the Harshaw Chemical Company. Mr. Borlet next held a position as an M&T district sales manager on the West Coast and was later affiliated with McGean Chemical Company in the Detroit area.

Mr. Borlet is current National President of American Electroplaters' Society, Inc. He is also a member of the Electrochemical Society and the American Society for Testing Materials (ASTM).

♦

H. E. MARTIN has become chairman and chief executive officer of Metal & Thermit Corp. Replacing him as president is **CHARLES J. BEASLEY,** formerly vice president and secretary.

H. W. BUCHANAN, previously a vice president, has been named executive vice president.

Mr. Martin has been president of Metal & Thermit Corporation since 1954. Prior to this time, he was with the Babcock & Wilcox Company.

A licensed professional engineer in the State of New York, Mr. Martin majored in chemical engineering at Polytechnic Institute of Brooklyn. He is a Fellow of the American Society of Mechanical Engineers, a member of the American Institute of Chemical Engineers, a director of the Manufacturing Chemists' Association and a trustee of the United Engineering Trustees.

C. J. Beasley

H. W. Buchanan

Mr. Martin also is president and a director of M & T Products of Canada Ltd., International Titanium Corporation and M & T Chemicals, AG, Zug, Switzerland. He is a director of Chromium Corporation of America.

Mr. Beasley has been associated with Metal & Thermit since 1949, serving as

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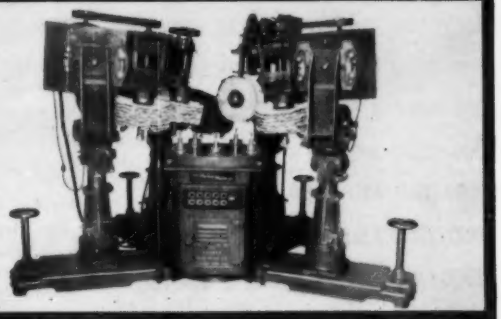

■ An indexing type rotary machine, the Model 4-5 Packer-Matic incorporates 5 rotating spindles on the work table. Four belt-driven heads handle tampico, sisal, wire wheels or cotton buffs. (Automatic Electric uses 2 abrasive belt heads and 2 buffing heads.) Production range can be varied from 350 to 1,050 parts per hour. (Easily satisfying Automatic Electric's immediate and future requirements.) Heads can be set at any angle from horizontal to vertical (solving the problem of Automatic Electric's irregular dial surfaces.)

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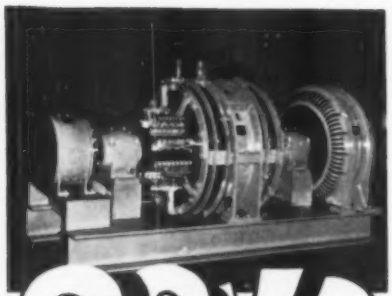

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assistant controller, controller, and vice president and secretary.

He came to Metal & Thermit from Lybrand, Ross Brothers and Montgomery, where he was senior auditor.

Mr. Beasley was graduated Cum Laude from the College of Commerce, Notre Dame University. He served with the U. S. Marine Corps during World War II, and retired in 1959 with the rank of Colonel, USMCR.

He is a director of M&T Products of Canada Ltd., Chromium Corporation of America, and an officer of International Titanium Corporation. He is a member of the Controller's Institute and the Union League Club.

Mr. Buchanan joined Metal & Thermit Corporation in 1947 as a chemical engineer. Since then, he has served as sales manager for M&T chemicals, metals and plating products. He was appointed vice president and manager of the Chemical Division in 1960.

He received the BS degree in chemical engineering from Rensselaer Polytechnic Institute, and the MS degree in industrial management from Massachusetts Institute of Technology where he was a Sloan Fellow.

He is a member of the Society of the Plastics Industry, Society of Plastics Engineers, American Electroplaters' Society, American Chemical Society and is chairman of the House Committee and a trustee of the Chemists Club.

A. JAMES FISHER JR.

A. J. Fisher Jr., executive vice president, Metal & Thermit Corporation, died Friday, August 11, 1961, at Norwalk Hospital, Norwalk, Conn. He was 47.

Mr. Fisher joined Metal & Thermit in 1955 as a member of the market research department, and was elected executive vice president in 1960. Prior to this association, he was manager of chemical sales development for U. S. Industrial Chemicals, Inc , New York, and president of U. S. Polymeric Chemicals, Inc., Stamford, Conn.

He was former secretary and a director of the Chemical Market Research Association, and a director of the Commercial Chemical Development Association.

Born in Rochester, N. Y., he was graduated from Phillips Exeter Academy in 1932, and from Princeton University in 1936.

A resident of New Canaan, Conn., Mr. Fisher was a member of the board of governors of the Country Club of New Canaan and president of the Princeton Alumni Association there.

He is survived by his wife, Mrs. Elizabeth Roberts Fisher; a son, Thomas Roberts; a daughter, Elizabeth; and his father, Arthur James Fisher of Clearwater Beach, Fla.

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Above: Accessory camera attachment.
Left: Observing the plated deposit.

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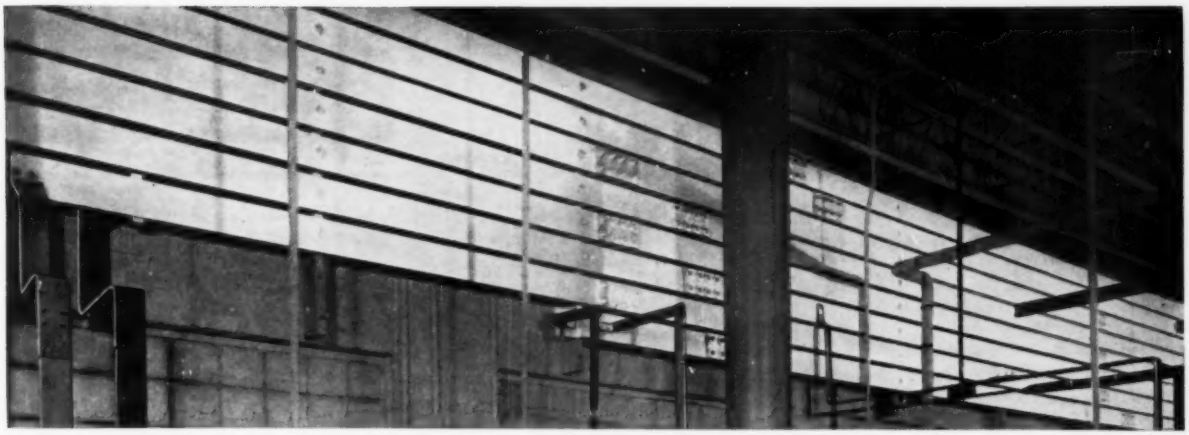

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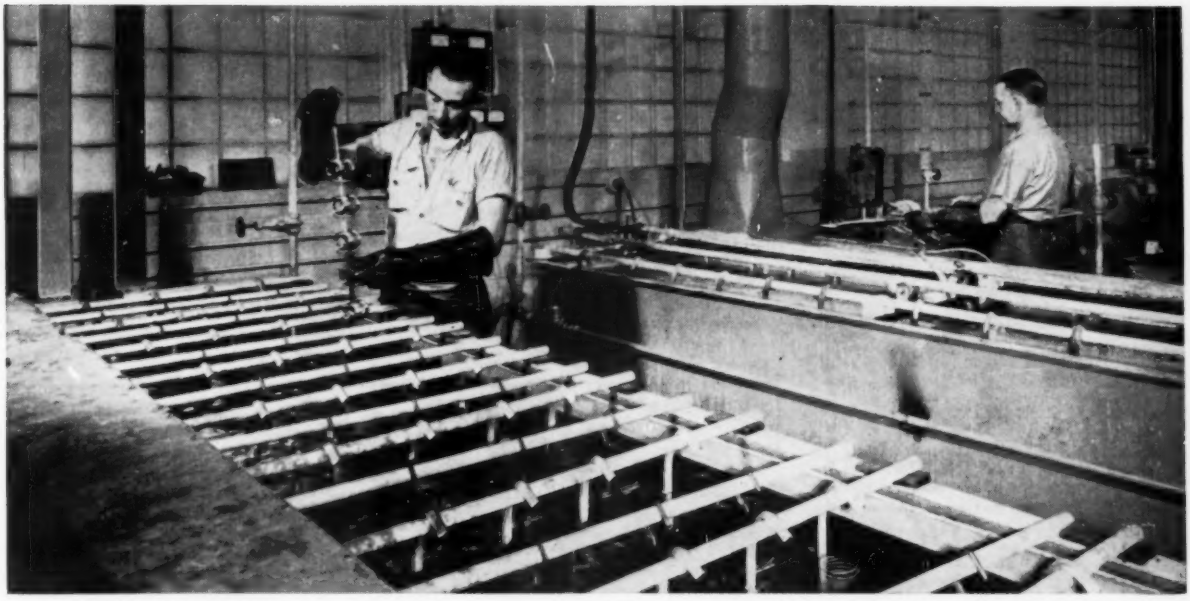

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When you buy aluminum bus, you can save at least a dollar for every one you spend.

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ROME CABLE
DIVISION

BRANCH NEWS

Total AES Branches U. S., Canada, Australia, October 1, 1961—61.

CINCINNATI
Platers Win Ball Game at Branch Picnic

The Annual Branch Picnic was held at the Farm on August 19 with 94 members and guests in attendance.

Playing customer ball, in the annual baseball game, the suppliers went down to defeat by a score that not even the victorious "dippers" could estimate. Many men crossed home plate, but no accurate count could be agreed upon.

An excellent roast beef dinner climaxed the picnic, and a few ambitious souls still had enough energy for shuffleboard, horseshoes and card playing after dinner.

Dick Evans of Bill Young and Co., Inc. and **Clyde Seymour** of American Standard were in charge of the arrangements and did an excellent job.

Regular meetings of the Cincinnati Branch will resume on Wednesday, September 27, at the Engineering Society.

David L. Kaplan
Secretary

MIAMI
Jungle Cruise Delights Members; Past President Allen Now a Miamian

On Saturday, August 19, 1961 Miami Branch members with their families had their annual summer outing. Instead of an evening affair, an all day jungle cruise was made on Biscayne Bay, New River and Everglades waterways, with a luncheon stop at the famous Pier 66 Yacht Club in Fort Lauderdale. The jungle waterways produced no alligators, except at a Seminole Indian village where alligator wrestling by an Indian boy was photographed.

Walter J. Allen, AES National President in 1923 and now 88 years old and celebrating his 63rd wedding anniversary on August 16, 1961, has been discovered living in our midst at 105 N.W. 144 St., Miami, Fla. and would appreciate hearing from all of his old friends. He is believed to be the oldest living Past President, as well as the earliest living one in that office.

Frederick Fulforth
Secretary

SANTA CLARA VALLEY
Bammann Elected First President of New Branch

On July 12, 1961, the Santa Clara Valley Branch of the American Electroplaters' Society met in the Conference Room of the Hewlett-Packard Company, 1501 Page Mill Rd., Palo Alto, Calif.

During the short business meeting, the following were elected to serve as officers for the forthcoming year:

President, **Stanley Bammann;** 1st vice president, **Elston A. Flores;** 2nd vice president, **Wilbur V. Ferry;** secretary, **John E. Tracy;** treasurer, **E. R. Dodge;** educational chairman, **Charles Kuster;** sergeant-at-arms, **Tom Yagi.**

Members of the board of managers appointed by President Bammann are: **Burton Trygstad, Edward Duffek** and **Trevor Harry.**

Total membership of this newly formed Branch, 40. Total attendance of the meeting, 35.

The next meeting will be held at the Old Plantation, San Antonio Rd., Los Altos, at 7:30 o'clock, August 8. Future meetings will be held on the second Tuesday of each month.

John E. Tracy
Secretary

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

DIRECT MAIL SERVICE FOR PLATING MAGAZINE ADVERTISERS

Neither AES's membership directory nor PLATING MAGAZINE mailing list are released to anyone for any purpose. As an accommodation to PLATING MAGAZINE advertisers wishing to link their PLATING product advertising with direct mail promotion, however, PLATING maintains a direct mail service featuring the largest audited paid circulation in the electroplating, metal finishing and allied arts field.

A bonafide example of the advertiser's proposed mailing must first be received and screened by PLATING. If mailing assignment is accepted thereby, the entire quantity must be shipped by the advertiser to PLATING MAGAZINE's Newark, N. J. office, pre-stuffed, for PLATING addressing and mailing. No mailing of less than a thousand pieces is acceptable. For further, fuller details, including costs, write or call Thomas W. Lowe, Production Manager, PLATING MAGAZINE, American Building, 443-445 Broad Street, Newark 2, N. J. (Telephone HUmboldt 2-3400).

AES MEMBERSHIP REPORT

ELECTIONS

Boston: A. J. Deneen, R. T. Hebert, L. Donovan
Central Michigan: W. F. Gillette, C. V. Rzepka
Hamilton: J. Watson, V. K. Hill
Miami: C. W. Tyson
Pittsburgh: W. C. Cochran
Providence-Attleboro: A. J. Boutin, A. J. Lanfredi
Rockford: C. E. Raymer
Santa Clara Valley: B. J. Joosten, J. C. Glasgow, R. J. Lesko, J. Griffin, H. J. Dupre, P. Franz, R. Z. Reade
Southeastern: R. N. Belcher
Member-at-Large: G. H. Kissin, J. Onishi, M. Kaptein

REINSTATEMENTS

Miami: C. P. Jenkins

TRANSFERS

Baltimore-Washington: E. C. Bertucio to Newark
Los Angeles: D. Althouse to San Francisco, E. Armstrong to San Francisco
Montreal: R. Chalut to Toronto
San Francisco: B. F. Regan to Santa Clara Valley
Member-at-Large: W. Fluehmann to Newark
Waterbury: A. G. Griffin to Kansas City

RESIGNATIONS

Blue Ridge: S. M. Proco
Buffalo: A. J. Gude, C. H. Crowl
Boston: W. Acks
Detroit: A. J. Bacha, Jr., A. J. Glaier, F. J. Lester, W. G. Cryderman, C. R. McBeth, F. M. Oliver, W. H. Ross Jr., S. P. Sax
Lancaster: J. Masek, H. Quickel, E. Schweitzer, P. Johns
New Haven: F. Gargiulo, D. C. Reams Jr.
Providence-Attleboro: D. Goff
San Francisco: D. E. Pierce, A. F. Lee, D. J. Heinlen
Member-at-Large: E. R. Canning

SUSPENSIONS

Boston: J. P. Gill, R. A. Peak, R. C. Petit, C. Hall, G. B. Moran, E. B. Murphy
Hartford: D. Marmer
Indianapolis: H. L. Sendelbach, D. H. Bender, J. Botts, R. W. Buck, M. Plummer, G. Marquis, K. L. Turpin, T. Wilhoite, L. J. Bell
Providence-Attleboro: K. Blackler, W. F. Cahill Jr., J. E. Lukas, L. J. Murphy, E. G. Shearstone
Member-at-Large: R. Fyfe, A. L. Pahud

DEATHS

Cincinnati: L. Alfrey
Philadelphia: O. W. Mott
Pittsburgh: O. M. Null
Providence-Attleboro: E. Spiedel, W. Parks

LIFT! HELP YOUR BRANCH ATTAIN ITS MEMBERSHIP EXPANSION GOAL

EDUCATION

SHORT COURSE AT VPI

The short course in metal finishing offered by Virginia Polytechnic Institute, Blacksburg, Virginia from August 22 to September 1 was attended by 23 electroplaters. Six of the registrants followed the advanced course, while 17 studied the elementary procedures.

Living accommodations were provided at the college dormitories. All of the students joined in a watermelon feast on the Thursday evening before the final session.

The course was conducted by Dr. Nelson F. Murphy, Professor of Chemical Engineering at the institute, assisted by Hugh S. McCutcheon, a graduate student. Carl A. Witherspoon Jr. of Poly-Scientific Corporation, Blacksburg and first vice president of the AES Blue Ridge Branch was visiting lecturer.

There were daily three-hour lectures covering: Basic chemistry for platers, basic electrochemistry for platers, principles of electroplating, types of plating solutions, constituents of a plating solution, purpose of constituents, mechanism of electrodeposition, current distribution, properties, structure and brightness of electrodeposits, control of plating operations, instrumentation in the plating plant and engineering fundamentals. In the afternoons, experimental work was performed during a three-hour laboratory period.

The students were divided into four groups. The group interested in the elements of electrochemistry formed three groups, one each for the study of chromium, for nickel, and for copper plating. Each group studied various aspects of deposition of their own metal and also tried out the baths prepared by the other groups. Hull cell tests, solution analysis, preparation of the basis metal by pickling, cleaning, and polishing, determination of efficiency and quality of plate were some of the problems studied. A contaminated copper bath was corrected. Both acid and cyanide copper solutions were evaluated for use on various metals, including cast iron, stainless steel and aluminum. Watts nickel and sulfamate nickel were plated and the brittleness of the deposits compared. For chromium, the location of anodes for internal plating was studied.

The advanced group studied the best conditions for plating cadmium on nickel-copper plates on 430 steel. These coatings were then fused to form an alloy surface. Deposition of black nickel was investigated. Plating on various aluminum alloys was evaluated. Plating with periodic reverse for black nickel and for cadmium plate was tried.

To complete the course, each group submitted a short report of the work done.

PLATING MAGAZINE invites AES Branches to furnish news for publication in PLATING concerning electroplating courses sponsored.

PLATING AND METAL FINISHING STUDENTS AT VPI

Front row, left to right: Dr. Nelson F. Murphy; Edward Sedenka, U. S. Steel Corp.; H. E. Branch, Newport News Ship; Steve M. Proco, Poly-Scientific; James G. Kitchen, Belmont Casket Co.; James E. Lafferty, AMP, Inc.; Donald Bethea, Brookley Air Force Base; Richard R. Barrett, Barrett Chemical Co.; Maurice Spivak, Springfield Armory; Fred W. Flickinger, AMP, Inc.; Joseph Berezanski, Patterson Plating; R. Schmidhammer, Poly-Scientific. Back row: James C. McConnell, NASA; Charles T. Kellogg, Hubbard Hall Chemical Co.; A. H. Breece, Western Electric Co.; George Wilder, IBM Corp.; Charles R. Akers, Poly-Scientific; Henry McFadden, Inland Motors Corp.; B. L. Linkous, Poly-Scientific; A. G. Patterson, Patterson Plating Ltd., Toronto, Canada; James Pettit, Hubbard-Hall Chemical Co.; John Edmisten, Poly-Scientific; Carl A. Witherspoon Jr., Poly-Scientific Corp. (J. A. Harless and F. D. Anderson, both Poly-Scientific, not shown in picture.)

ELECTROPLATING COURSES

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Louis Serota, Instructor
18-wk. course—Fee: None

CHICAGO, ILL.—Illinois Institute of Technology
J. M. Andrus, Instructor
18-wk. course—Fee: $80

CLEVELAND, OHIO—Max S. Hayes Trade School
H. Pochapsky Instructor
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INDIANAPOLIS, IND.—Purdue University Extension
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16-wk. course—Fee: $45

MONTREAL, QUE.—Polytechnique Institute
Dr. Andre Hone, Instructor
3-year course—Fee: $50

NEWARK, N. J.—Plants and Laboratories in Area
F. J. LaManna, Instructor
Climax-Grayway Co., 560 Winters Ave., Paramus, N. J.
14-wk. course—Fee: $25

NEW HAVEN, CONN.—New Haven College
L. J. Durney, Instructor
4–15 wk. Semesters—Fee: $50 per semester
Sept. 1961–Jan. 1962—Electroplating Practice
Feb.–June 1962—Electroplating Fundamentals
Students may enter at any point.

PHILADELPHIA, PA.—Temple University Technical Institute
Dr. S. Heiman, Instructor
4 Semesters, each 16 wks.—Fee: $37 per Sem.

PORTLAND, OREGON—Portland State College
Dr. J. R. Mickelsen, Instructor
10-wk. course —Fee: $10

PROVIDENCE, R. I.—Central Senior High School
Omer Jette, J. Fogarty, J. Castriotta Instructors
2-year course—Fee: None

ST. LOUIS, MO.—Hadley Technical H. S.
Dr. Otto C. Klein, Instructor
16-wk. course—Fee: $10

SAN ANTONIO, TEX.—Trinity University
W. P. Wisdom, Instructor
18-wk. course—Fee: $10

SAN FRANCISCO, CAL.—Cubberly H. S., Palo Alto
William Ferry, Instructor
24-wk. course—Fee: $3 per 12wk semester

SOUTH BEND, IND.
Dr. H. J. Wiesner, Instructor

SPRINGFIELD, MASS.—Chicopee Vocational H. S.
R. J. Girard and E. F. Koetsch Jr., Instructors
Two 12-wk. courses—Fee: None

TORONTO, ONT.—Central Technical High School
R. H. Clark, Instructor
22-wk. course—Fee: $15—non-res.
$ 5—city res.

VANCOUVER, B. C.—Vancouver Technical School
Walter Kellerman, Instructor
6-mo. course—Fee: $15

EVANSVILLE, IND.—Joseph B. Kushner Electroplating School
Joseph B. Kushner, Instructor, 621 S. Norman Ave.
4 mos. to 1 yr. correspondence courses—Fee: $150

SANTE FE SPRINGS, CAL.—Weiner Electroplating School
Milton Weiner, Instructor, 12631 Imperial Highway
3 courses, each 12 weeks—Fee: $40
Practical Electroplating & Metal Finishing, starts Sept. 18, 1961
Theoretical Chemistry & Electrochemistry, starts Jan. 8, 1962
Theoretical & Practical cost & calculations, starts Apr. 2, 1962

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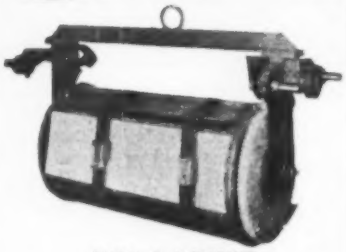

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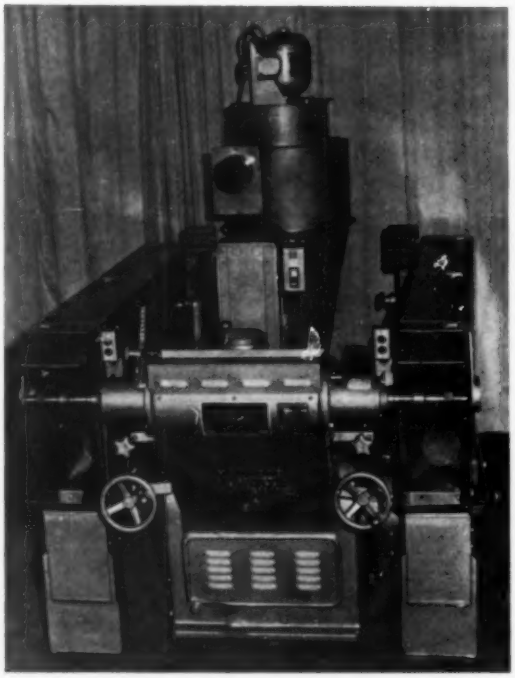

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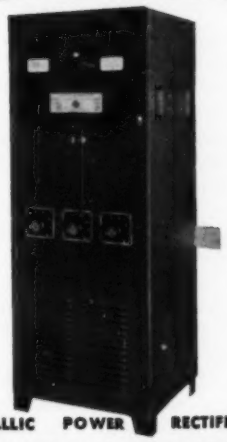

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FUTURE MEETINGS

AMERICAN ELECTROPLATERS' SOCIETY

October 28,	1961—**Midwest Regional Council,** Third Annual Technical and Workshop Session, Argonne National Laboratories, Lemont, Illinois.
November 11,	1961—**Lancaster Branch Annual Ladies Night,** West Shore Country Club, Camp Hill, Pennsylvania.
November 15,	1961—**Central Iowa Branch Installation Meeting,** Roosevelt Hotel, Cedar Rapids, Iowa.
December 1,	1961—**Melbourne Branch Annual Dinner,** Melbourne, Australia
December 1-2,	1961—**Detroit Branch Annual Educational Meeting and Banquet,** Statler-Hilton Hotel, Detroit, Mich.
December 2,	1963—**Special Meeting, Executive Board, AES,** Statler Hilton Hotel, Detroit, Michigan.
Dec. 15-16,	1961—**Newark Branch Annual Educational Session and Banquet,** Robert Treat Hotel, Newark, N. J.
December 16,	1961—**Bridgeport Branch Dinner-Dance,** Stratfield Hotel, Bridgeport, Conn.
January 11-14,	1962—**Executive Board Meeting,** Hotel Marott, Indianapolis, Indiana.
January 13,	1962—**Ninth Interim Meeting, Supreme Society,** Hotel Marott, Indianapolis, Ind.
January 20,	1962—**Grand Rapids Branch Annual Meeting,** Pantlind Hotel, Grand Rapids, Mich.
January 27,	1962—**Chicago Branch Annual Educational Meeting and Banquet,** Conrad Hilton Hotel, Chicago, Ill.
February 9-10,	1962—**Fourth Annual Dixie Regional Educational Meeting,** Dinkler-Plaza Hotel, Atlanta, Georgia
February 17,	1962—**New York Branch Annual Technical Session and Banquet,** Hotel Statler-Hilton, New York, N. Y.
March 2-3,	1962—**Philadelphia Branch Annual Educational Session and Banquet,** Benjamin Franklin Hotel, Philadelphia, Pa.
March 3,	1962—**Eighth Annual Tri-State AES Regional Educational Session and Banquet,** Biltmore Hotel, Dayton, Ohio.
April 21,	1962—**23rd Annual New England Regional Meeting,** Hotel Statler, Hartford, Conn., Springfield Branch, Host.
May 1,	1962—**Central Michigan Branch,** Annual Educational Session and Banquet, Hotel Hayes, Jackson, Mich.
June 24-28,	1962—**49th AES Annual Convention,** Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.

FUTURE MEETINGS

January 19, 1963—**Tenth Interim Meeting, Supreme Society,** Kansas City, Missouri.

June 24-27, 1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City. N. J. Sponsorship Newark Branch.

June 15-18, 1964—**51st AES Annual Convention,** Sheraton-Jefferson Hotel, St. Louis, Missouri.

June 16-18, 1964—**Sixth Industrial Finishing Exposition,** St. Louis, Missouri.

June 28-July 1, 1965—**52nd AES Annual Convention,** Statler Hotel, New York, N. Y.

June 26-30, 1966—**53rd AES Annual Convention,** Hotel Fontainebleau, Miami, Florida. Dixie Regional Council, Sponsor. Southeastern Branch, Host.

June 1967—**54th AES Annual Convention,** Dallas, Texas

INTERSOCIETY

October 16-19, 1961—**2nd International Congress on Vacuum Technology,** Sheraton Park Hotel, Washington, D. C.

October 23-27, 1961—**43rd National Metal Exposition & Congress,** Cobo Hall, Detroit, Mich.

Nov. 26-Dec. 1, 1961—**American Society of Mechanical Engineers,** Winter Annual Meeting, Statler-HiltonHotel, New York, N. Y.

Nov. 27-Dec. 1, 1961—**28th Exposition of Chemical Industries,** New York Coliseum, New York City.

Jan. 30-Feb. 2, 1962—**Society of Plastics Engineers,** 18th Annual Technical Conference, Penn-Sheraton Hotel, Pittsburgh, Pa.

February 5-9, 1962—**American Society for Testing Materials,** Committee Week, Statler-Hilton Hotel, Dallas, Texas

March 6-7, 1962—**Society of Vacuum Coaters.** 5th Annual Technical Conference, Sheraton-Cleveland Hotel, Cleveland, Ohio

March 19-23, 1962—**National Association of Corrosion Engineers, 18th Annual Conference, and Corrosion Show,** Kansas City Auditorium, Kansas City, Mo.

May 6-10, 1962—**The Electrochemical Society,** Spring Meeting, Statler-Hilton Hotel, Los Angeles, Calif.

June 24-29, 1962—**American Society for Testing Materials,** Annual Meeting and Apparatus Exhibit, Statler-Hilton Hotel, New York, N. Y.

Sept. 16-20, 1962—**The Electrochemical Society,** Fall Meeting, Hotel Statler-Hilton, Boston, Mass.

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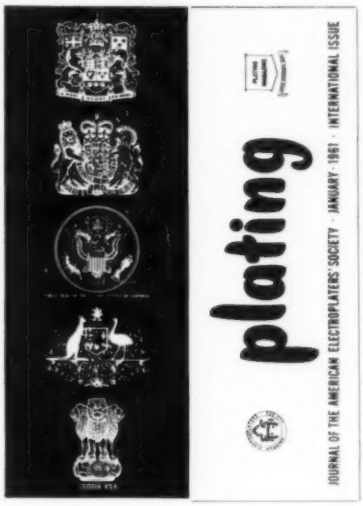

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ROCHELLE SALTS, 100 lb 53.00

SODA ASH, 100 lb 9.10

SODIUM CYANIDE, 2000 lb 25.80

SODIUM STANNATE, 100 to 600 lbs 80.80

ZINC CYANIDE, 100 lb 59.00

(*Cents per lb, f o b at point shipped*)

Prices in effect September 11, 1961.

These prices, while derived from authentic sources, may be expected to vary by geographic location, quantity purchase, FOB and other terms, market influences and variations. They are presented solely as a general guide.

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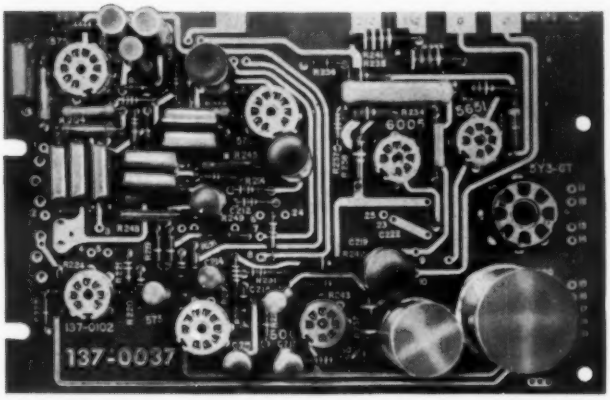
2 Electronic Plating Tips you can profit from!

You know B&A® Metal Fluoborates speed plating at lower costs. Now here are some other advantages you shouldn't overlook.

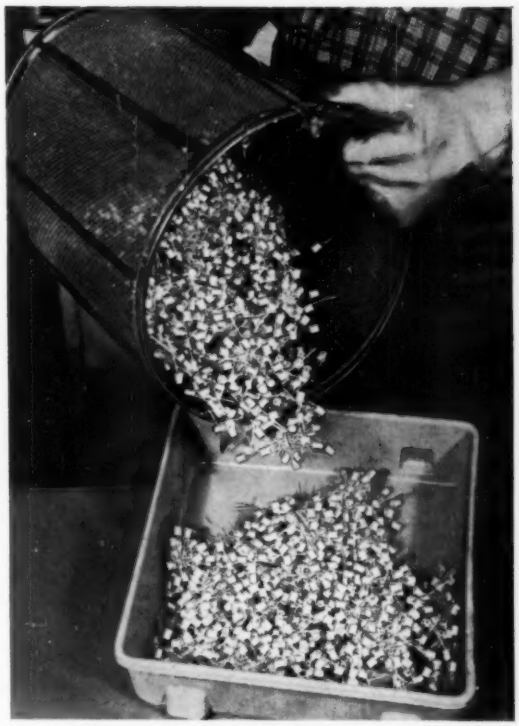


B&A Fluoborates Improve Printed Circuits . . . Need an effective stop-off for etching? Use a lead-tin alloy from B&A fluoborate solutions. The deposit is readily soldered even after plated part has been stored for a long time—and more reliable assembly results.

☐ Plated wiring calls for B&A copper fluoborate. It gives high speed deposition, with minimum maintenance and control problems.

☐ An active undercoat for precious metal deposits in printed circuits is nickel from B&A nickel fluoborate. The bath is simple to prepare and maintain, is stable, offers excellent control.

B&A Metal Fluoborates come in concentrated solution form. Baths made from these fluoborates have excellent stability, are easily maintained . . . have good covering power . . . give fine-grained deposits of good color. For technical data as it applies to your application, just drop us a note, or ask to have a B&A representative call.



Tin-Plated Semiconductor Components . . . Tin fluoborate baths are used to plate semiconductor components—not only for high plating rates, but to improve reliability during assembly as well. Reason: *Tin deposited from B&A fluoborate solutions is readily soldered.* Plating is easy, too. The bath is practically self-sustaining, is operated at room temperature, and control is simple. In deposits where a lower melting point is desired, a lead-tin alloy is used. For other electronics applications, B&A cadmium fluoborate and indium fluoborate offer similar advantages to those listed above.

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FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 1004.

"THROWS, LEVELS, BRIGHTENS BETTER than any bright nickel bath we've tried before." Speaking of Levelume 220 are partners MIKE SPANOS and FRANK WROBEL, A&A Plating Co., Detroit, shown with some of their 40 types of work.

20% more production on toughest job shop plating

...at no extra cost

Nothing tests a bath like a job shop—and A&A Plating Co. is one that often takes on "problem" jobs for other platers. Work ranges from marble size to big cash register shells, much of it tough combinations of zinc die casts and steel. And in 9 years of testing, A&A hasn't found a bright nickel bath that's "more profitable or easier to work with than Levelume 220." Some of the benefits that A&A reports:

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